MODERN PLASTICS

DECEMBER 1947

★ *New Pages from the* **DUREZ** *Diary*

● No housewife is tempted to "let the windows go another week" when they glide into easy-cleaning position on plastic tracks!

These tracks make wrestling with window frames a thing of the past. They're molded into light-hued sills of Kys-ite, a versatile new structural material that has uncounted possibilities in industry. Developed by the Keyes Fibre Co. in conjunction with Durez engineers, Kys-ite combines wood pulp and a special Durez phenolic resin in a high-impact material. It has notable acid, water and alkali resistance, self-insulation, permanent lustrous finish, and color range.

This sill track is an ingenious feature of the Andersen Corporation's* "Windowalls." The use of Kys-ite adds new beauty, convenience, and durability. Sash are placed in one plane as in casement windows, yet open and pass each other at a touch. They're easily removed and replaced without tools, handy for inside cleaning!

This is one more case of fitting Durez phenolic plastics to a job that no other material might do so well in so many ways. If you have a problem that plastics may solve, why not use our knowledge as phenolic specialists . . . our 26 years of background with the most versatile of them all?

Durez Plastics & Chemicals, Inc., 512 Walck Road, North Tonawanda, N.Y.

* ANDERSEN CORPORATION, BAYPORT, MINN.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB

Catalin...The SEEN Quality in Fine Radio Appreciation

Today, a truly fine new table model radio and an equally fine new automobile, have this in common: Under-the-bonnet perfection is generally conceded. Their sales appeal, now, is chiefly one of eye-appeal . . . the power factor is implied through lithe body design, beauty is registered by trim and color, allure and luxury keynote the appointments . . . the desire to possess beckons from without!

Leading radio manufacturers, alert to a public trend that now judges "fine birds by fine feathers"—are proceeding wisely to outwardly enhance their finest in housings cast of Catalin . . . *the gem of plastics.*

Catalin, incomparably beautiful by reason of its rich penetrating color values, is by far, radio's most exquisite and interpretive material. It embodies characteristics that connote strength, power . . . together with a feeling of ruggedness, longevity and undying sparkle that remind you of semi-precious stones. As to outward allure and luxury, it possesses irresistible tangibles that make it decoratively welcome within the home—and worthy of that home's most cherished setting.

We might mention innumerable other applications wherein Catalin finds itself equally desirable, readily adoptable and sales-wise effective, but this is radio's page, and therefore we would rather not interrupt this program for any commercial other than to invite product manufacturers and their designers to consult with the Catalin staff—at any time—especially when plans are being thought out . . that's when costs can be conserved!

The *Catalin* cabineted table model radio pictured above is the new RCA Victor* Model #66x8, Product of the RCA Victor Division, Radio Corporation of America, Camden, New Jersey.

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS

VOLUME 25 DECEMBER 1947 NUMBER 4

CONTENTS

"EXECUTIVE and EDITORIAL OFFICE: 122 E. 42nd St., New York 17, N. Y. Published the 5th of each month by Modern Plastics, Inc., at Publication Office: Twentieth and Northampton Sts., Easton, Pa. Entered as second class matter, May 28, 1940, at the Post Office at Easton, Pa., under the act of March 3, 1879." Subscription $5.00 a year, $8.00 for two years in U. S., its possessions and South America. Canadian subscriptions $5.50 per year. All other countries $6.00 per year, payable in New York funds.

THE owners of this streamlined speedster will be proud of its smart interior for years to come—because it is upholstered with a flexible plastic sheet made from one of the GEON polyvinyl resins. Like other products made from Geon, the combination of properties which it provides is not duplicated by other materials. This Geon upholstery is beautiful—pleasant to touch—highly resistant to wear—to fire, spray, moist air, oils, grease, gasoline, and acids. Soap and water keep it clean.

These valuable properties which Geon imparts are found in countless numbers of other products from shower curtains to tank linings, fly swatters to wire insulation, upholstery to highway markers.

Beauty that needn't be pampered

It can be pressure or injection molded, calendered or cast into sheets or film. In solution or latex forms it can be applied as coatings or impregnants for fibers, fabrics, paper and cardboard. Products made from Geon may be flexible or rigid, clear or opaque, brilliantly or delicately colored.

Doesn't this suggest something to you that could be made better from Geon?

We make no finished products from Geon, or from any other raw materials manufactured by B. F. Goodrich Chemical Company. However, we'll be glad to work with you on any special problems of applications. We are particularly interested in developing new end uses for these materials. For more information please write Dept. O-12, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

Geon
Polyvinyl Materials

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

TRIMMING COSTS and WEIGHT

WITH
CHICAGO MOLDED
Plastics

Folks who have hedges to trim like the new Sunbeam Hedge Trimmer. It not only simplifies a tough job . . . but it's so light and easy to handle. A combination of light metals and light, extra strength molded plastics is the answer.

The principal plastics unit is the housing for the motor which also serves as the operating handle. It's a Chicago Molded job, of course . . . compression molded of a high impact phenol formaldehyde material with macerated canvas filler.

Because of the excellent heat insulating characteristics of this material the handle is always cool and comfortable, and it also has high electrical insulating qualities. These, combined with durable, smooth finish and high strength-to-weight ratio, insure long life, ease of handling, and maximum all 'round satisfaction.

Sunbeam is just one of hundreds of America's leaders of industry who have found Chicago Molded a good place to bring their plastics molding problems . . . and have them solved. They know we have the knowledge, the experience, and the facilities for handling any molded plastics job . . . large or small . . . compression or injection. And they know our reputation for quality and service.

This is something worth remembering. Make a note of it. And when you're ready to discuss your next molded plastics job, drop us a line. There's no obligation.

CHICAGO MOLDED PRODUCTS CORPORATION

1046-60 N. Kolmar Ave. Chicago 51, Illinois

Representatives in principal industrial centers

COMPRESSION *and* **INJECTION** *molding of all plastic materials*

EDITORIAL STAFF
Editor: CHARLES A. BRESKIN
Managing Editor: A. PAUL PECK
Technical Editor: DR. GORDON M. KLINE
Engineering Editor: FRED B. STANLEY
Features Editor: R. L. VAN BOSKIRK
Art Director: DONALD R. RUTHER
Midwestern Editor: VAL WRIGHT
Associate Editor: VIRGINIA SUE WILSON
Associate Editor: WARREN H. GOODMAN
London Editor: PAUL REILLY

Write READER'S SERVICE for plastics information

EXECUTIVE STAFF
Publisher: CHARLES A. BRESKIN
General Manager: ALAN S. COLE
Associate Publisher: HIRAM McCANN

BUSINESS STAFF
Advertising Manager: ALAN S. COLE

P. H. Backstrom
M. A. Olsen
J. M. Connors
R. C. Beggs
A. M. Rothenberg
Burton W. Gussow
Joseph A. Drucker
W. F. Kennedy

Promotion Manager: JOHN G. KASTEN
Production Manager: DANIEL M. BROADS
Ass't. Production Manager: B. J. FARINA

Executive and Editorial Offices:
122 E. 42nd St., New York 17, N. Y.
Tel., MUrray Hill 3-0655

Circulation Department
Circulation Manager: FREDERICK A. KLEIN
32 Broadway, New York 4, N. Y.
Tel., WHitehall 4-4782

Branch Offices
Chicago 1: 221 N. La Salle St.
Manager: J. M. Connors
Tel., Randolph 5588
Cleveland 14: 815 Superior Ave.
Manager: R. C. Beggs
Tel., Superior 0737
Los Angeles 5: 2412 W. 7th St.
Manager: A. M. Rothenberg
Tel., Fairfax 2978

Member Audit Bureau of Circulation
MODERN PLASTICS is regularly indexed in Industrial Arts Index and Industex.

New viewpoints for 1948

This has been a tough year for the plastics industry. It has been a different kind of "tough" from the war years and from 1946 when the big problem was to obtain material. The really "tough" part of 1947 was the sudden realization that customers are no longer begging for goods.

The entire industry became a bit panicky in the middle months of 1947 when the bottom seemed to have dropped out of everything except thermosetting molding, but fortunately a quick recovery was made and the industry, in our opinion, is now on the road to increasing importance and prosperity.

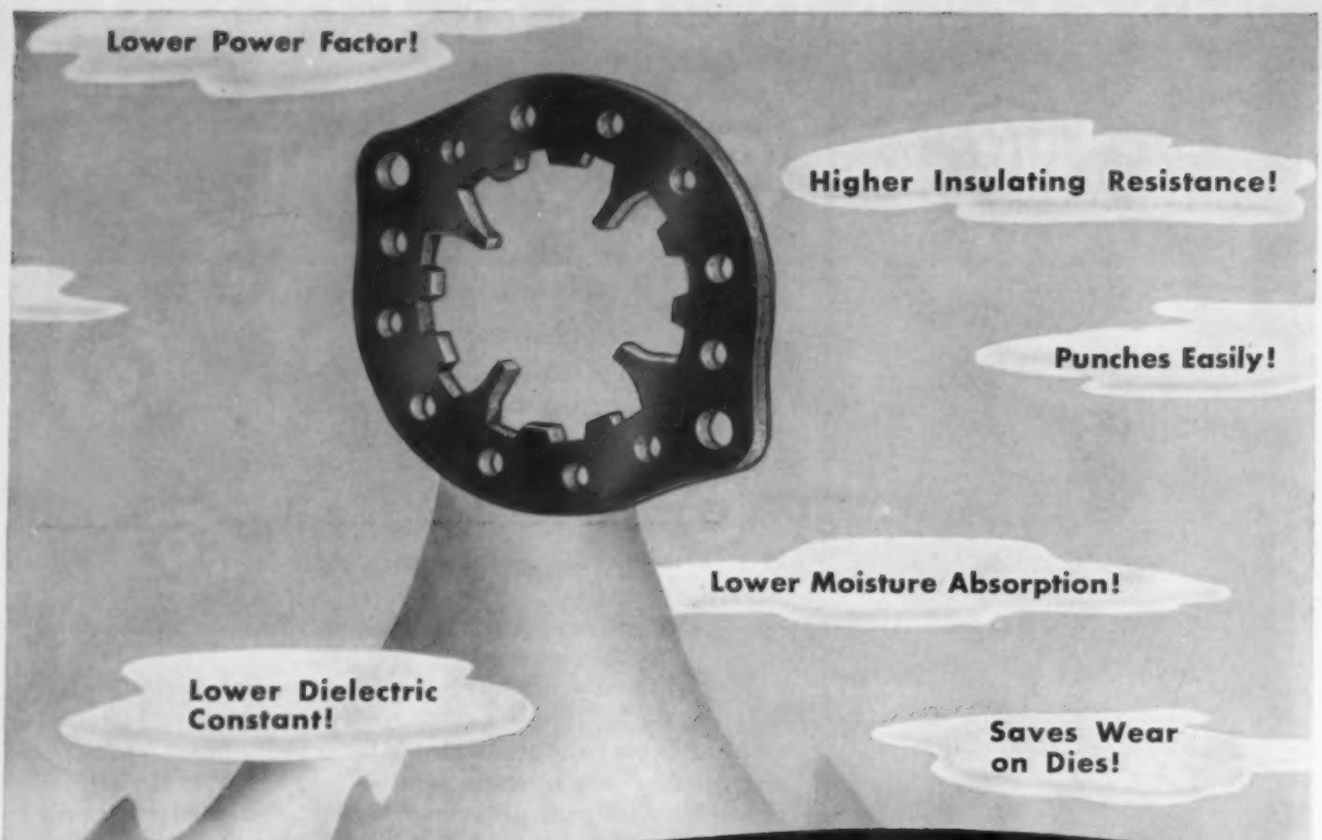
The bad times were really a blessing in many respects. First and foremost, the shakedown has greatly reduced the number of weak spots. It is not to be denied that in the reducing process, some of the better and more responsible operators were caught in the net. But, by and large, the companies that were eliminated in the past year were shoestring operators, many of whom admitted that they jumped in with the hope of being able to make a quick profit and then get out from under. No industry welcomes that kind of management philosophy.

Another blessing has been the upsurge of new ideas and new products. This production of new plastics items is the development we have all been waiting for. Industry leaders have long been unanimous in saying that plastics would never grow up until processors learned how to engineer their products so as to take advantage of plastics' properties and to produce items superior to those made of any other material.

The industry is to be congratulated on the progress that has been made in this direction. An inspection of almost any plastics processing plant will disclose products that meet this classification. The onus of "substitute" is gradually dying out. Plastics are being sold on their own merits as materials that are highly satisfactory for a myriad of uses.

Merchandising, too, is on the upswing. There is a greater tendency to tell the buyer more about the advantages and uses of products being bought. Manufacturers in numerous lines are beginning to point to their use of plastics as a selling aid in their advertising. Manufacturers of plastic products are developing sales staffs whose members are far more than mere order takers. Beyond doubt, as we see it now, merchandising is still one of the most important phases needing immediate attention, but the industry is fully aware of this need and is taking steps.

Yes, 1947 was a tough year. But it has taught its lessons. The industry is now ready to go ahead with a solid base underfoot. It is forgetting past troubles and all that talk about misapplications, overexpansion, fly-by-nighters, etc. Those skeletons should be buried deep and permanently. The time has come to forget past errors and concentrate on plastics' superior qualities. Chins up and no excuses will be the plastics industry's Resolution No. 1 for 1948.



RICHARDSON OFFERS THE NEW T-800 INSUROK!

a combination of properties unparalleled in phenolic laminates

Once again Richardson is *first* with the best! Now you can get a phenolic laminate which has practically everything manufacturers of electrical equipment, appliances and apparatus want in a plastic—in the NEW T-800 INSUROK!

T-800 INSUROK has a better combination of properties . . . higher in insulating resistance, lower moisture absorption, lower power factor, lower dielectric constant, and minimum loss factor . . . than any other phenolic laminate which can be punched with moderate heating.

T-800 INSUROK is easy to process. Intricate parts can be punched cleanly with the use of moderate heat.

If you are manufacturing anything in the electrical field—particularly in electronics, radio, television, hearing aids, or anything else—you will want the full facts about the NEW Richardson T-800 INSUROK. Send today for Bulletin L-103. Requests on company letterheads only will be promptly answered.

Specification Data on INSUROK Grade T-800

Thickness	1/16"
Volatile	0.30%
Moisture Abs.	0.22%
Expansion	
Center	.0001"
Edge	.0000"

Tests at Room Conditions

Specific Gravity	1.300
Dielectric Strength	
Short Time	658
Step by Step	554
Power Factor	.0197
Dielectric Constant	3.90
Loss Factor	.0767

Tests after 96 hrs. at 90% Relative Humidity 104° F.

Power Factor	.0210
Dielectric Constant	3.99
Loss Factor	.0838
Insulation Resistance	167,000

The RICHARDSON COMPANY

Sales Headquarters: MELROSE PARK, ILL. FOUNDED 1858 LOCKLAND, CINCINNATI 15, OHIO

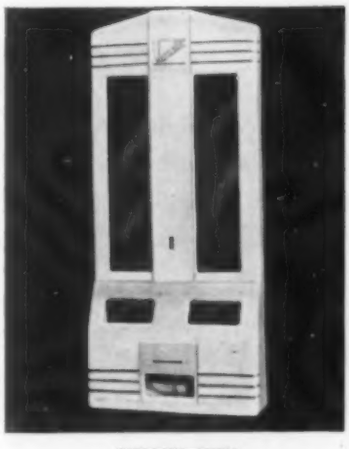
Sales Offices

NEW YORK 6, 75 WEST STREET
PHILADELPHIA 40, PA., 3728 NO. BROAD STREET
CLEVELAND 15, OHIO, 336-7 PLYMOUTH BLDG. • DETROIT 2, MICH., 6-252 G. M. BLDG. • ST. LOUIS 12, MO., 3579 PERSHING AVENUE
ROCHESTER 4, N. Y., 1031 SIBLEY TOWER BLDG.
MILWAUKEE 3, WIS., 743 NO. FOURTH STREET
INDIANAPOLIS 18, IND.

Factories: MELROSE PARK, ILL. • NEW BRUNSWICK, N. J.

SOLD BY SIGHT . . . THROUGH "LUCITE"

Better view . . . more sales-appeal . . . with a Du Pont Plastic



WHAT'S NEW

Lustrous Du Pont "Lucite," backed with paint, gives this vending machine front an attractive three dimensional appearance, while its sparkling, clear windows display candy effectively. It is tough, durable, shatter-resistant, and the complete front is formed in one operation. Formed by Regal Plastic Co., Kansas City, Mo.

So close you can almost touch it! Yet that hot buttered popcorn is protected while it's enticingly displayed . . . under a cover of sparkling transparent "Lucite," formed all in one piece. No seams or braces to obstruct your view . . . no heat-conducting frames to burn attendants or customers. The heat-resistant "Lucite" means crystal-clear, all-round vision and safe handling. And forming it in one piece means lower assembly costs.

Because of the high tensile and flexural strength of Du Pont "Lucite," the one-piece top assures dependable performance. Its shatter-resistance guards against damage from knocks and blows. The manufacturer found all these properties . . . plus light weight, beauty, and durability . . . in "Lucite" acrylic resin.

In *your* business there may be a place for Du Pont "Lucite" or other Du Pont plastics, as a means of developing a fast-selling new product or giving an old one new usefulness, new beauty, and increased sales-appeal. Write now for literature. E. I. du Pont de Nemours & Co. (Inc.), Room 3612, Arlington, N. J.

Vending machine designed and manufactured by Edo Aircraft Corporation, College Point, Long Island, New York. Top of "Lucite" formed by Steiner Manufacturing Company, Long Island City, New York.

DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

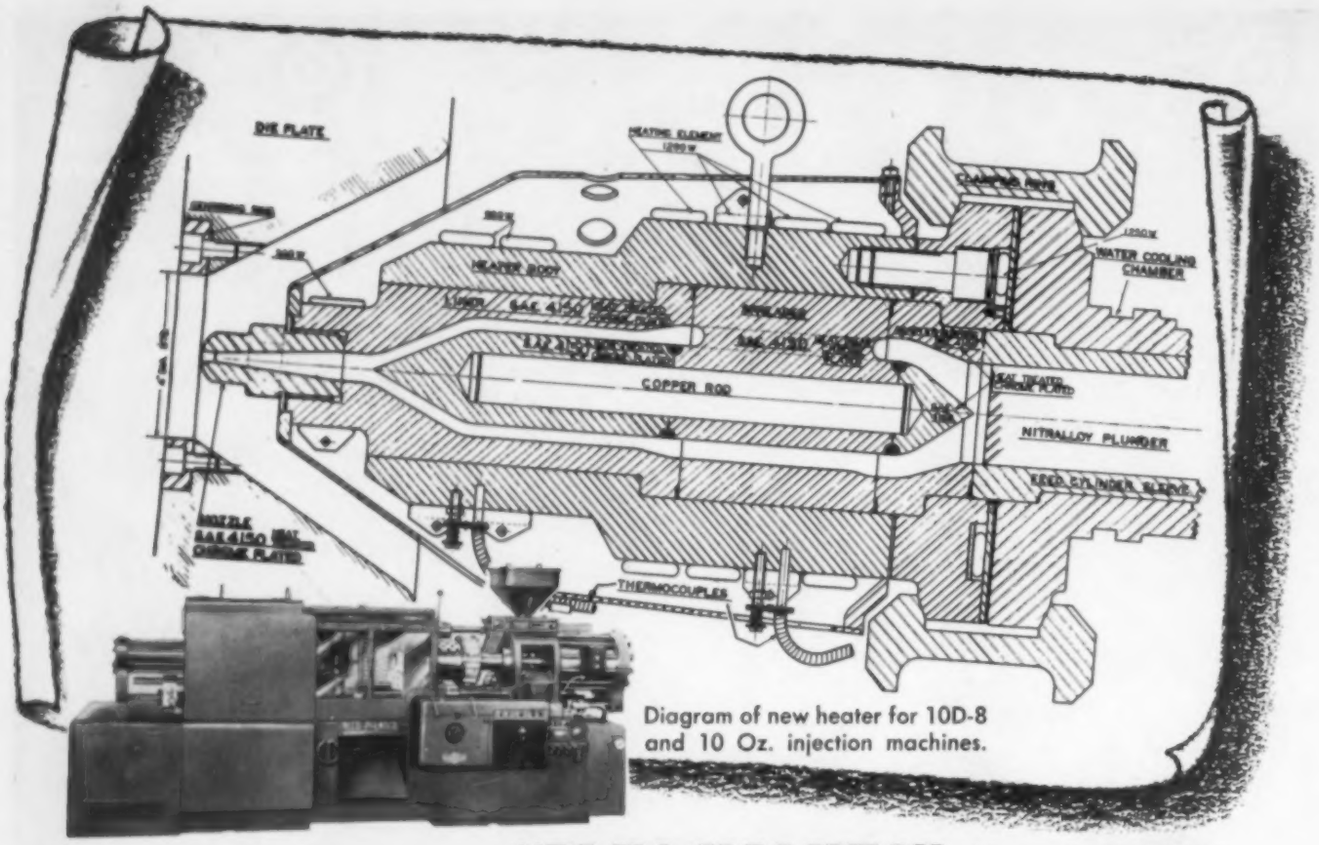


Diagram of new heater for 10D-8 and 10 Oz. injection machines.

Here are more "PLUS VALUES" for YOU . . . at no extra charge!

In keeping with its policy to provide the finest plastic injection molding machines, Reed-Prentice offers these advanced improvements in the 10D model . . .

plus SPEED: The machine cycle is speeded by means of a provision in the control circuit which advances the plunger at the end of the return stroke, thus shortening the injection cycle.

plus HEATER EFFICIENCY: A new scientifically designed heating cylinder of 4150 alloy steel with all internal surfaces chrome plated for resistance to corrosion and for ease of maintenance. The spreader core is of copper for maximum heat transference. Oversize heater elements also increase the heater efficiency. This new heater plasticizes the material faster and more throughly.

plus CONVENIENCE: Hardened insert centering ring in the stationary die plate is readily interchangeable to accommodate various sizes of mold centering plugs.

All these "plus value" innovations result in faster production and cut rejects to a minimum! For full information regarding these and other superior features of the complete line of Reed-Prentice plastic injection molding machines of 4, 8, 10, 12, 16 and 22 Oz. capacities, write Department D today.

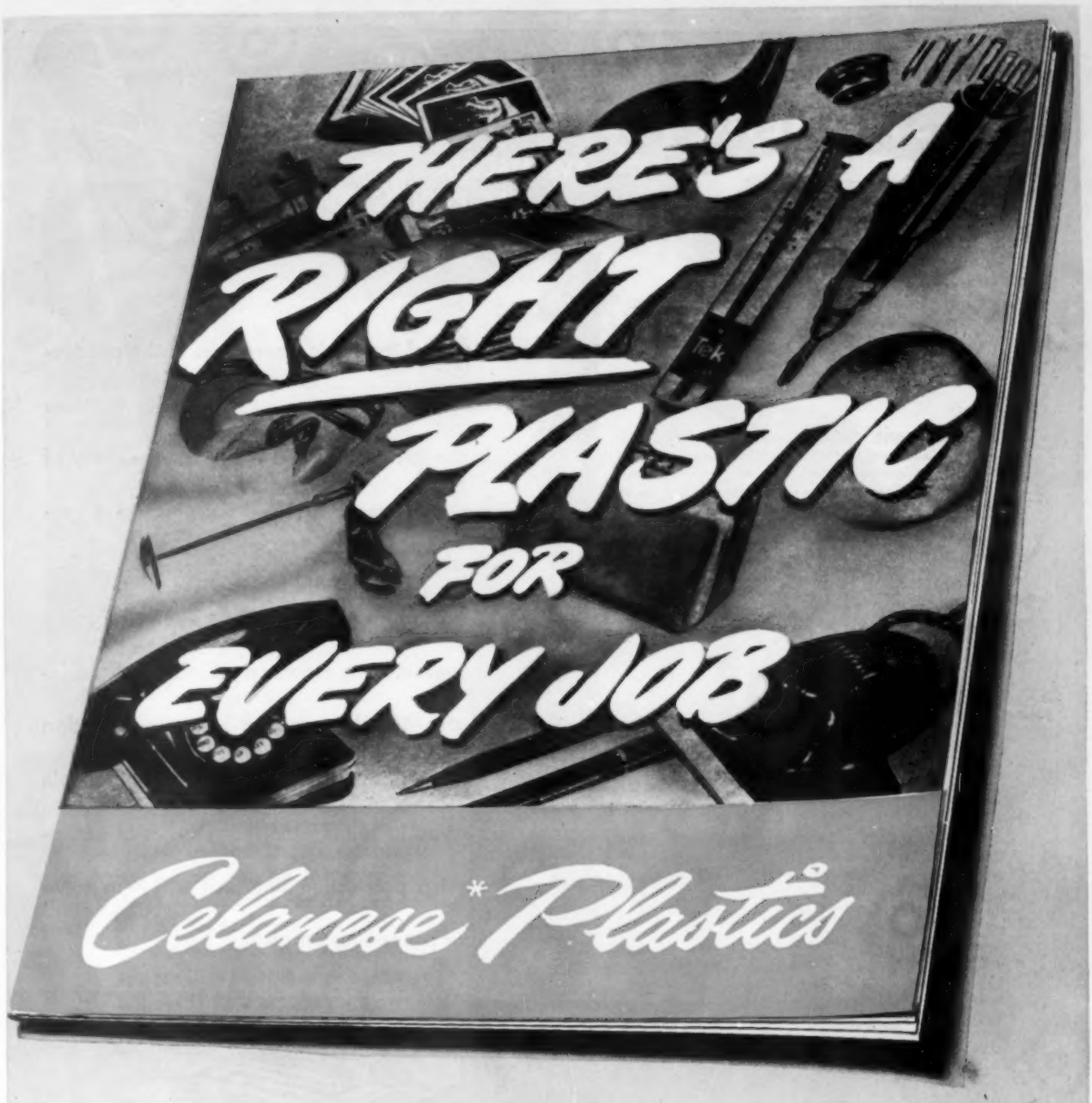
THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

INJECTION
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

CLEVELAND
1213 W. 3rd Street

NEW YORK
75 West Street

LOS ANGELES
2328 S. Santa Fe Ave.



Written to help you make a better product!

Here's the story of plastics at work—making good products better, and demonstrating how the careful selection of a plastic can determine product success.

For example, this booklet shows how many electrical products today are earning Underwriters' Laboratories' approval through the use of a new Celanese heat and flame resistant formulation, that gives manufacturers the thermoplastic advantages of high speed moldability and fabricating ease.

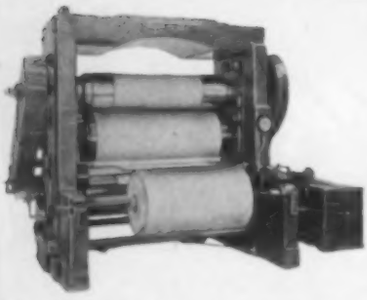
Send today for this 8-page fast-reading booklet. It is filled with helpful suggestions—for the designer, the manufacturer, and the merchandiser. Write to Celanese Corporation of America, Plastics Division, Dept. D1, 180 Madison Avenue, New York 16, N. Y.

*Reg. U. S. Pat. Off.

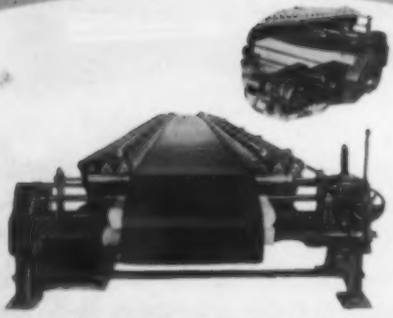
Standard Machines for SYNTHETIC FABRIC PROCESSING

• SAVE MACHINE DESIGNING COST
• GET PRODUCTION UNDER WAY MONTHS SOONER

TUBING MACHINE. Constant speed tubes can be operated up to 200 yards per minute. Movable carriage facilities selvage alignment. Speed is constant at all times and adjustable tension arrangement is provided. Accurate measuring obtainable. Interleafing attachments.



CALENDERING. Calendering machines for synthetic fabric processing are available in many different types and all tonnages. These machines work exceptionally well for chloride monofilms and Saran. All designed for cold or hot calendering.

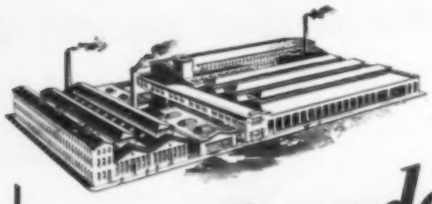


TENTER FRAME. Tenter frames are available with or without heat units. These are excellent for stretching and orienting extruded, calendered or cast sheets or film. Can be used on drying machines in coating operations.

Many of the basic operations in the production of synthetic fabrics are similar to those in the textile industry. That's why so many of our machines are suited for processing synthetic fabrics.

For many years we have been designing manufacturing machinery for the textile industry. This background in machine design and manufacturing facilities makes it possible for you to select from many types of equipment a production line that will help solve your processing problem.

Why not write us about your problem?



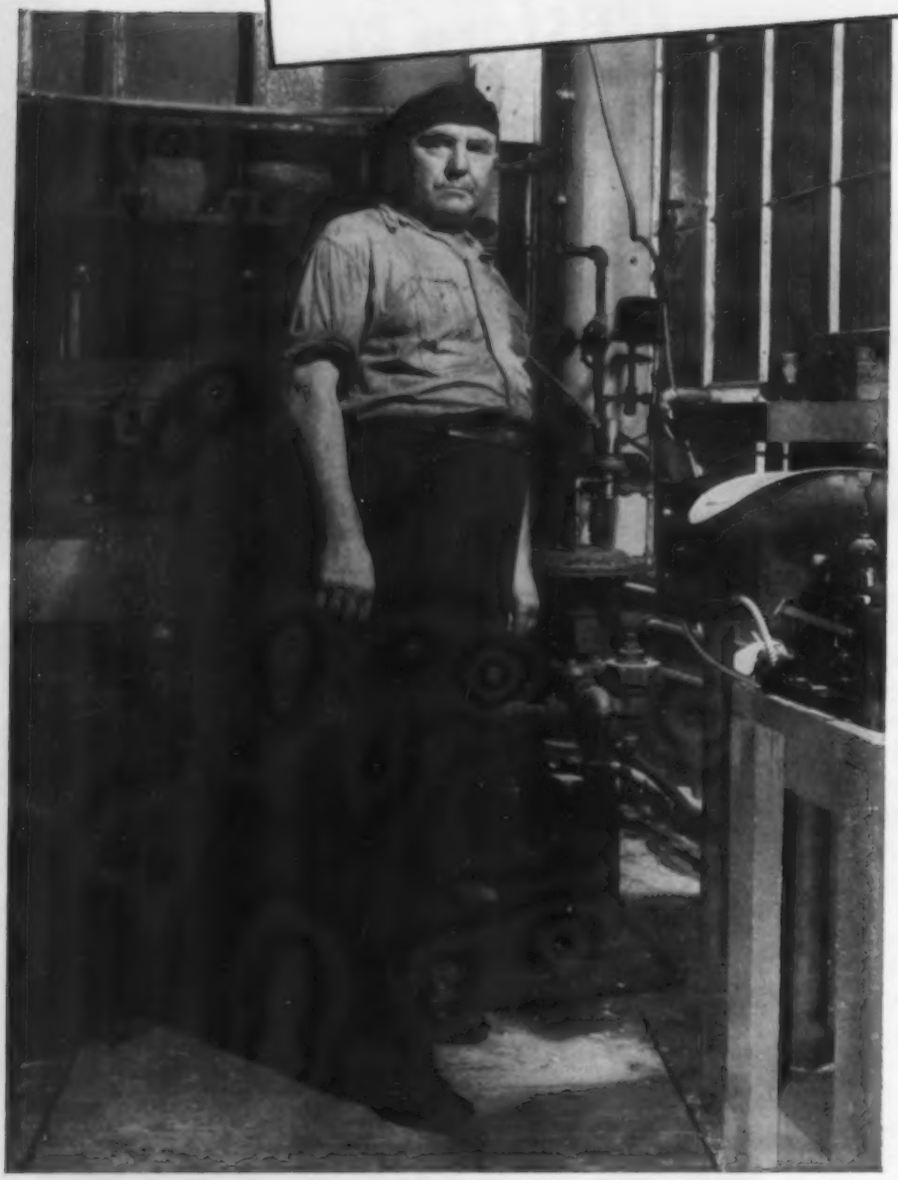
Van Vlaanderen
MACHINE COMPANY

370 Straight Street, Paterson, New Jersey

BLEACHERS • BREAKERS • CALENDERS • CALENDER DRYERS • CONTINUOUS WASHERS • COOLING CYLINDERS • COTTON BACK FINISHER DRYERS — ALL TYPES • DYEING MACHINES • ELECTRIC GUIDERS • EMBOSSING MACHINES • EXPANDERS • EXTRACTORS • FLOCK PRINTING MACHINES • GLASS CLOTH HANDLING EQUIPMENT • HEATING TOWERS • HYDRAULIC CALENDERS • IMPREGNATING MACHINES • MANGLES • MEASURING MACHINES • MIXING KETTLES • PAD DYEING MACHINES • PRINT WASHERS • ROLLING-UP MACHINES • ROLLS — RUBBER — PAPER • SINGEING MACHINES • SLACK PRINT WASHERS • SOAP WASHING MACHINES • SQUEEZERS • SUCTION MACHINES • TENSIONLESS CONSTANT SPEED DYE JIGS • TENTER FRAMES • TUBING MACHINES • WINDERS •

this is...

George Stefanick



● About 1907, George molded the first combination of Bakelite and asbestos, in a mold used for rubber-asbestos materials.

Today in our organization at Boonton, George and many others date their start in plastics back to those "pioneer" days.

Old? H—— No! — just in their prime — old only in good sound experience. And this particular group has been working together a good 25 years now at Boonton.

George's one of our special hydraulic maintenance men out at Boonton. No machines down — molds down — production down with George on the job.

See what we're driving at? Try Boonton for your next molded plastic part!

SO IT'S A NEW INDUSTRY, EH?
NOT AT BOONTON!

Molded at Boonton Means Good Plastic Molding

BMCD

SPI — Society of the Plastics Industry

FOR OVER 25 YEARS
CUSTOM ENGINEERS
OF MOLDED PLASTICS

BOONTON MOLDING COMPANY

MOLDERS OF MOST PLASTICS BY MOST METHODS

122 EAST 42nd ST., NEW YORK 17 · SUITE 1716-M MURRAY HILL 6-8540

FACTORY—BOONTON, New Jersey


Our sincere good wishes
for a joyful Christmas
and a New Year rich in accomplishment
HEYDEN CHEMICAL CORPORATION
New York 1, N. Y.

3 REASONS WHY BARRETT IS A BASIC NAME IN PLASTICS

1 DIBUTYL PHTHALATE. Liquid. Excellent color and low odor. Soluble or miscible with common organic solvents and diluents but practically insoluble in water. Compatible with most lacquer resins and has high plasticizing efficiency for nitrocellulose. Widely used for nitrocellulose lacquers and cements, synthetic rubber and resins.

2 DICYCLOHEXYL PHTHALATE. White crystalline powder. Used in unsupported vinyl films (for luggage, wall covering, shoes, upholstery, etc.) to which it imparts a hard, glossy surface with a firm hand. High solvency and excellent fluxing action at processing temperatures help eliminate calendering difficulties. Has superior properties with regard to water and oil absorption, and has very low volatility. Extruded products plasticized with dicyclohexyl phthalate are easily processed at operating temperatures yet possess toughness at room temperature.

3 PLASTICIZER 50B. Liquid. Excellent color. Highly compatible with vinyl resins, and used in both supported and unsupported vinyl sheeting and extruded vinyl products. Films plasticized with 50B possess low temperature flexibility, very soft hand at room temperature, good light and heat stability, transparency and lustre, and good resistance to water absorption and extraction by mineral oil. An excellent solvent for vinyl resins which provides good wetting action during processing.

Barrett®

®Reg. U. S. Pat. Off.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N.Y.

ONE OF AMERICA'S GREAT BASIC BUSINESSES

Want Plastics Costs UNDER CONTROL?

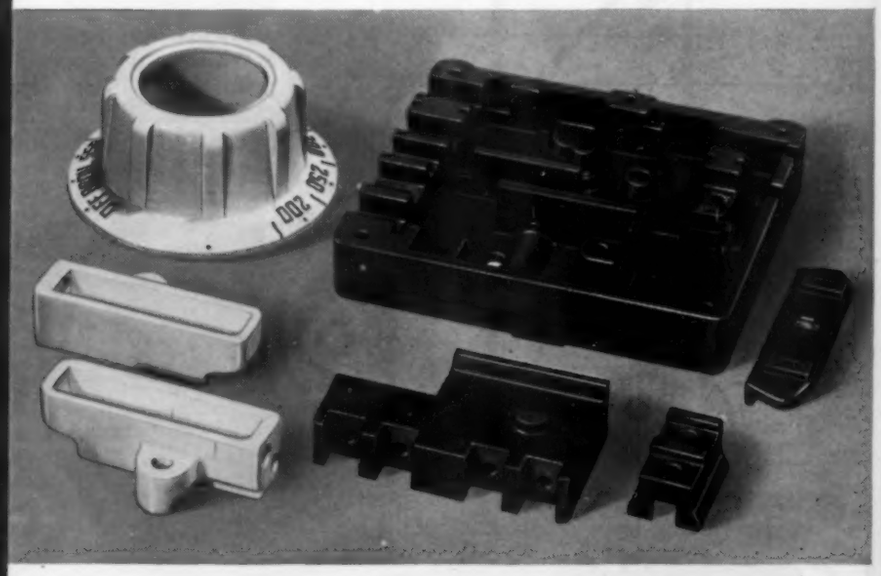
PERFORMANCE TO THE Nth DEGREE

For thoroughly dependable, ruggedly built thermostatic stove controls, industry turns to Robertshaw and its American Thermometer Division. And for plastics, this leader in its field turns to Kurz-Kasch. For the well-known Robertshaw thermostat, we mould 6 pieces of urea or phenolic material—control knob, broil temperature block, selector switch housing, line terminal block, contact arm insulating bar and 2 pilot light housings. *The original moulds for these pieces—some enlarged since—are still in quantity production after 9 years of service!*

ORIGINAL MOULD COST makes up a big chunk of most bills for plastic parts. Especially if worn moulds or outmoded moulds necessitate frequent replacements.

But when you can amortize the cost of one set of moulds over 9 to 15 years of steady scheduled production—Mister, that's a different story! That's the Kurz-Kasch story! We preach—and practice—the principle of designing for the future and building moulds for the future too. Take this American Thermometer electric thermostat. Some of the original moulds have been altered to double capacity, but the original cavities and forces are still in use after 9 years of busy production.

If your product or its components can be made better out of thermosetting plastics—and *if* you want your job designed and engineered for years of low-cost quantity production—ask for a Kurz-Kasch engineer. He'll answer both "ifs" without obligation.

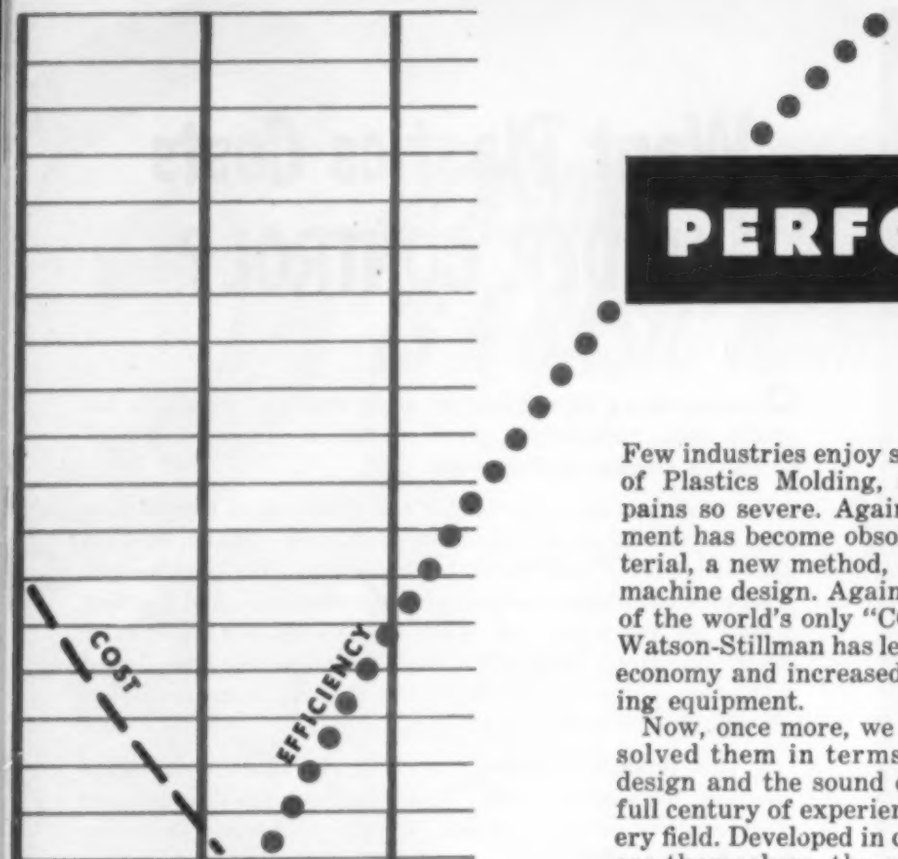


Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

Kurz-Kasch, Inc. • 1415 South Broadway • Dayton 1, Ohio
BRANCH SALES OFFICES: New York, *Lexington* 2-6677 • Chicago, *Harrison* 5473
Detroit, *Randolph* 5214 • Los Angeles, *Prospect* 7503 • Dallas, *Lakeside* 1022
St. Louis, *Rosedale* 3542 • Toronto, Canada, *Adelaide* 1377
EXPORT OFFICES: 89 Broad Street, New York City, *Bowling Green* 9-7751.

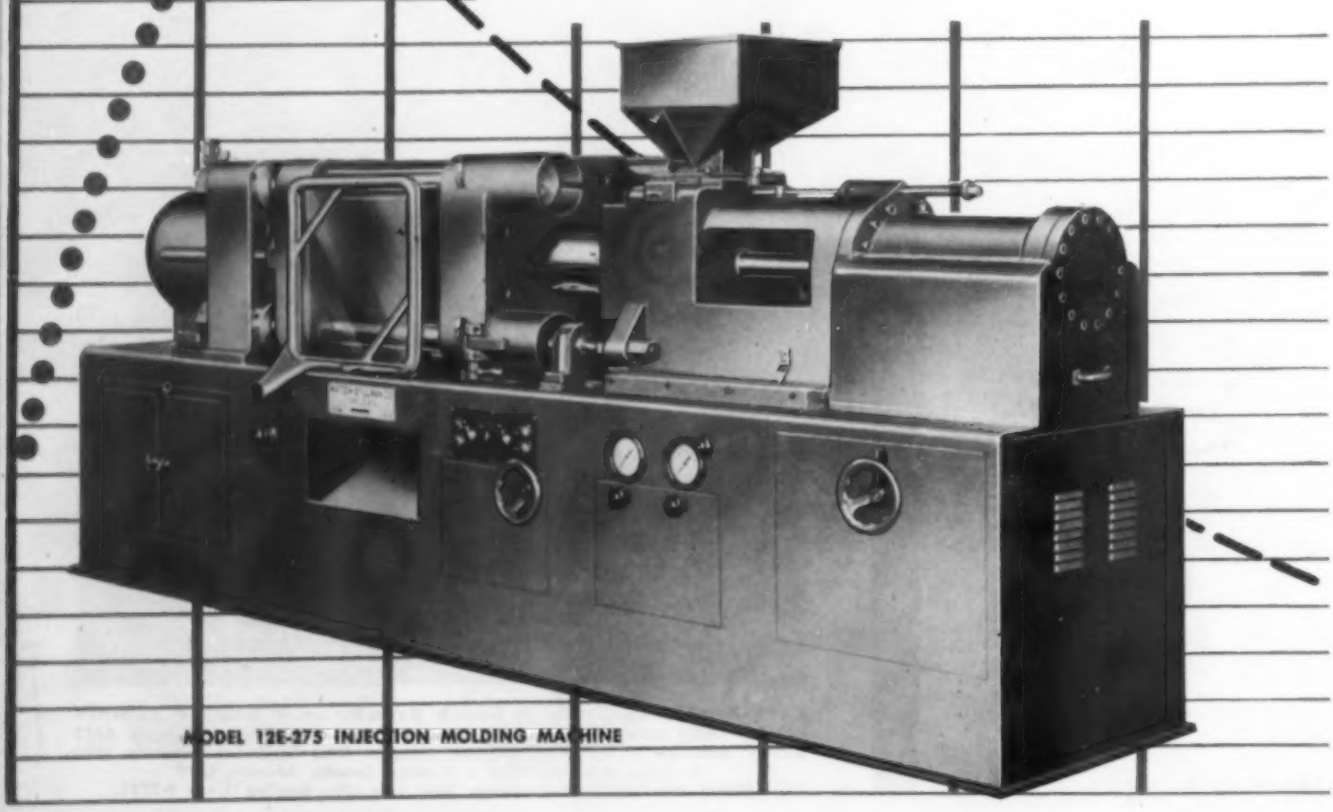
PERFORMANCE



Few industries enjoy such meteoric growth as that of Plastics Molding, or do they suffer growing pains so severe. Again and again existing equipment has become obsolete in the light of new material, a new method, or the advantages of a new machine design. Again and again—as you'd expect of the world's only "COMPLETELINE" builder—Watson-Stillman has led the parade toward greater economy and increased efficiency in plastics molding equipment.

Now, once more, we have faced basic problems, solved them in terms of new, more functional design and the sound engineering evolved from a full century of experience in the hydraulic machinery field. Developed in close cooperation with molders themselves, the new W-S heating cylinder design illustrated has been thoroughly proved in actual production.

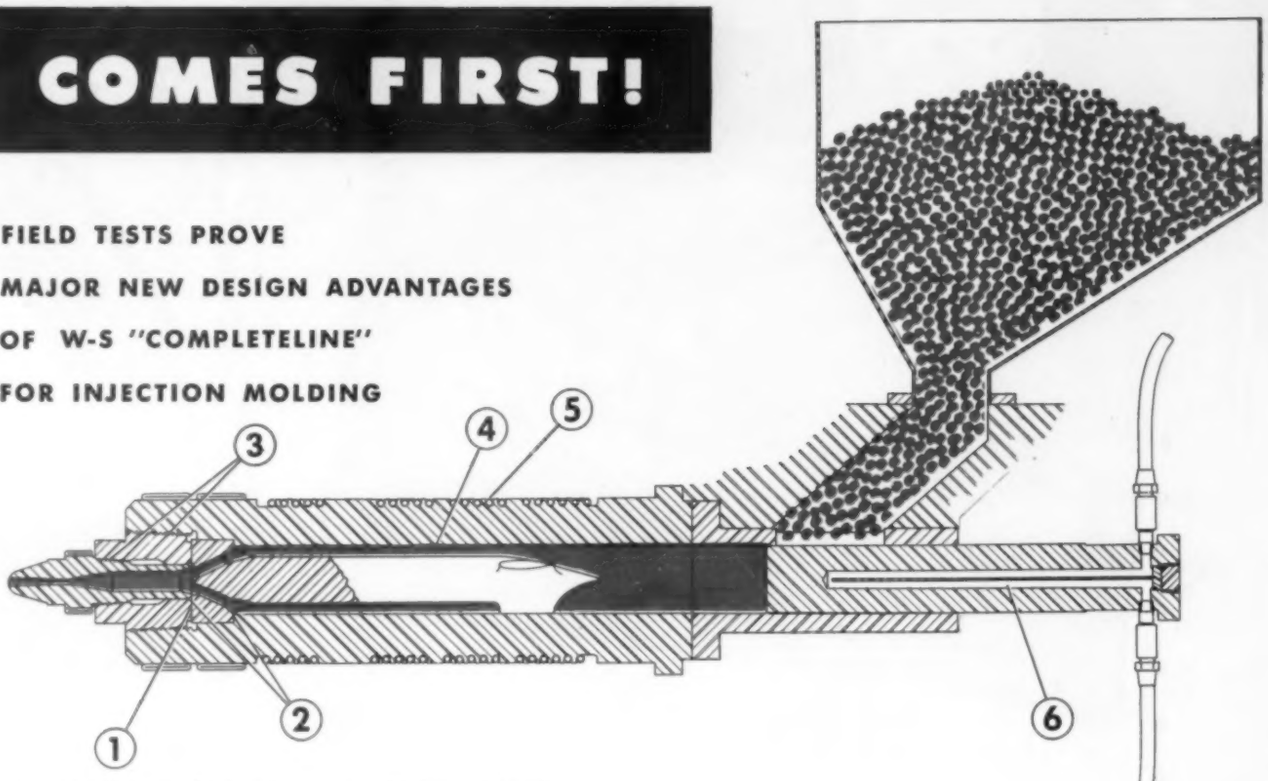
Appearance and construction features aside, we cordially invite comparison of *performance* of your present equipment with that of Watson-Stillman machines. You'll be impressed with the ease of operation and efficiency.



MODEL 12E-275 INJECTION MOLDING MACHINE

COMES FIRST!

FIELD TESTS PROVE
MAJOR NEW DESIGN ADVANTAGES
OF W-S "COMPLETELINE"
FOR INJECTION MOLDING



1. Small area of joints increases efficiency of seal.
2. Lapped surfaces for close fit, prevention of leaks.
3. Tapered adapter holds seats against highest pressures—design permits instant dismantling of nozzle and torpedo for rapid changeover with cylinder in place.
4. Chrome plate on all surfaces exposed to plastic material.
5. Efficient Calrod units have long life, large surface contact area, maximum heat per inch.
6. Water-cooled plunger of Nitralloy will not score or stick, has maximum service life.

The above is a diagrammatic section of the new W-S heating cylinder design for Injection Molding of thermoplastics. These features are incorporated in 5 standard "COMPLETELINE" models, ranging in capacity from 4 to 28 ounces; larger capacities on special order to 80 ounces, or more.

Don't overlook Watson-Stillman's "COMPLETELINE" of compression and transfer equipment for thermo-setting materials . . . multiple platen laminating and polishing presses . . . die-hobbing presses . . . lab equipment . . . and the "COMPLETELINE" engineering counsel that goes with them. Our advisory service includes data on every commercially known material and method of plastics molding.

Send your product samples or dimensioned drawings today, for prompt appraisal by an informed staff of plastics experts.

3804

WATSON-STILLMAN
HYDRAULIC MACHINERY DIVISION
Established 1848

FACTORY AND MAIN OFFICE
ROSELLE, NEW JERSEY

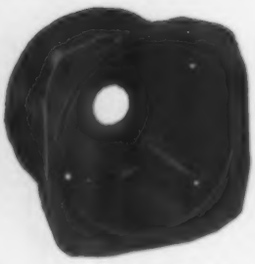
BRANCH OFFICES
PHILADELPHIA, PA. • CHICAGO, ILL.

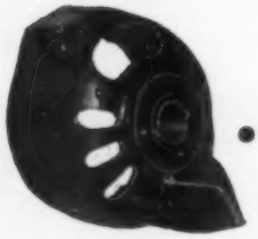
REPRESENTATIVES

BIRMINGHAM 3, ALA. . . . George M. Meriwether
BUFFALO, N. Y. . . . . Industrial Equipment Co.
CHICAGO, ILL. . . . . E. L. Essley Machinery Co.
CLEVELAND, O. . . . Frank T. Goetz Machinery Co.
DALLAS, TEX. . . . . Perry Machinery Co.
DENVER, COLO. . . . . Overgard Machine Tool Co.
DETROIT, MICH. . . . . Peninsular Machinery Co.
DULUTH, MINN. . . . . Anderson Machine Tool Co.
GRAND RAPIDS, MICH. . . E. L. Essley Machinery Co.
HOUSTON, TEX. . . . . Perry Machinery Co.
INDIANAPOLIS, IND. . W. K. Millholland Machinery Co.
MILWAUKEE, WIS. . . . E. L. Essley Machinery Co.
PITTSBURGH, PA. . . . . Stanley Berg & Co.
ROCHESTER, N. Y. . . . . Industrial Equipment Co.
ST. PAUL, MINN. . . . Anderson Machine Tool Co.
SYRACUSE, N. Y. . . . . Industrial Equipment Co.
TULSA, OKLA. . . . . Perry Machinery Co.

Foreign Sales Representatives: OMNI PRODUCTS CORP., 460 Fourth Ave., New York 16, N. Y. Correspondents Throughout the World

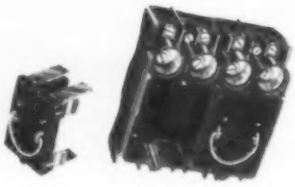
MANUFACTURERS OF THE MOST COMPLETE LINE OF HYDRAULIC MACHINERY





Insulation SENDS ONLY THE BEST . . .

For a Merry Christmas and a Happy New Year



WHETHER it's a warm Xmas greeting or a part, custom-molded by Insulation, it's as welcome as a package from home.

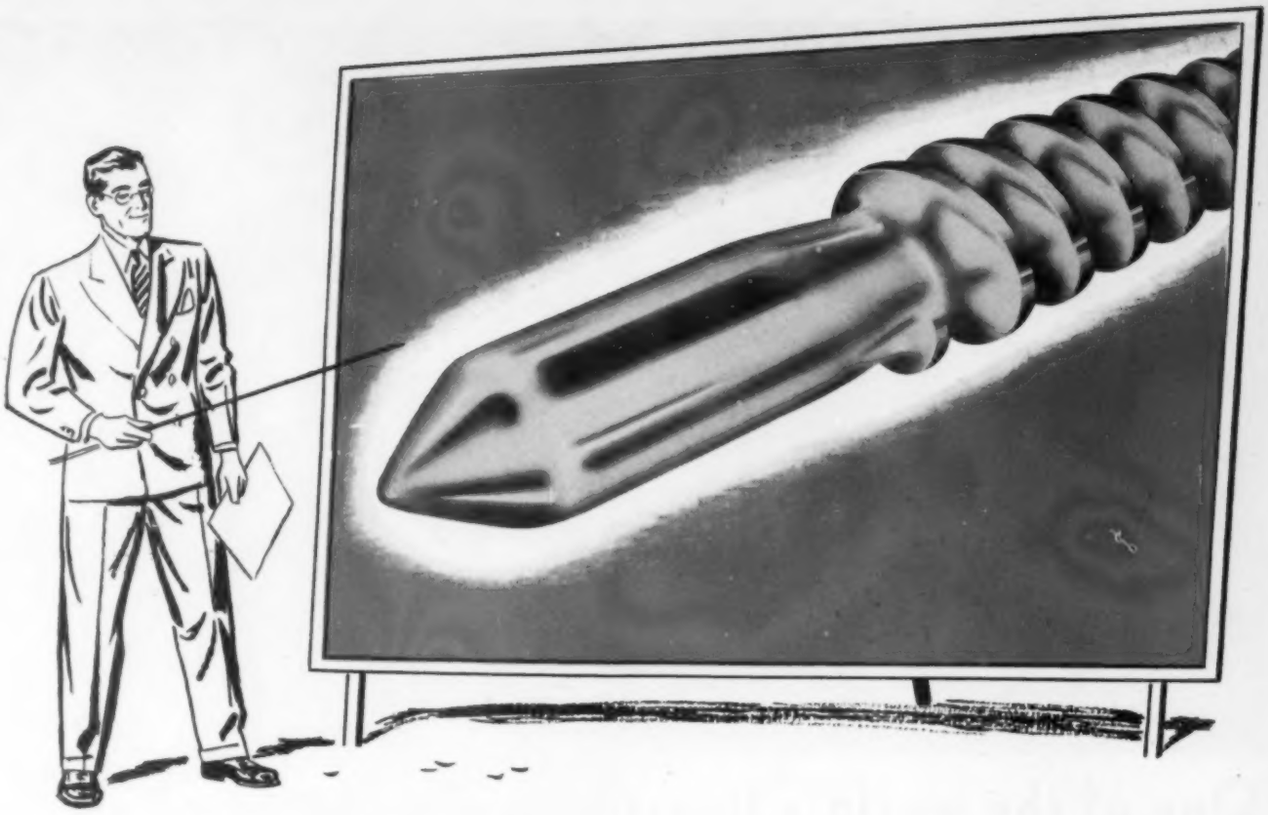
Successful manufacturers "gift" themselves all year with Insulation's custom-molded parts . . . and find Insulation meets the most rigid specifications and the most difficult delivery dates.

Try Insulation for quotes on your next custom-molded job . . . you'll find Insulation sends only the best!

INSULATION MANUFACTURING CO., INC.

Custom Molders of Plastics for Industry

13 New York Avenue • Brooklyn 16, N. Y.



The Torpedo that's never "fired"

IT isn't likely that the torpedo type screw shown above will ever be "fired" off the job . . . it's too valuable a production tool . . . after years of profitable service it will probably be replaced with a duplicate.

Part of the success of this screw is its design . . . the ability of its nose or "torpedo" to mill the material and to transfer heat quickly. The torpedo screw, a patented and exclusive NRM design, is considered a "must" for the proper extrusion of Cellulose Acetate, Cellulose Acetate Butyrate, Ethyl Cellulose and Polystyrene.

But, like all other NRM screws there are many factors that make it so outstandingly different.

All NRM screws are machined and finished on specially designed NRM equipment to eliminate the non-uniformity problem that is common with the older, customary hand finishing methods.

In NRM's completely equipped screw finishing shops, screws are continually inspected in every stage of machine finishing to assure concentric balance, precision uniformity of flights and the streamlining of flight surfaces.

Because extreme accuracy is maintained through every machining operation, NRM screws are characteristically free of pulsation.

Long life is assured by a unique screw hardening process developed by NRM engineers to provide a uniform hardness to flight lands and bearing surfaces.

NRM engineers are available to help you obtain better extrusion production through the use of better equipment. Write us about your problems and we will work with you to obtain the results you desire.

NRM

NATIONAL RUBBER MACHINERY CO.

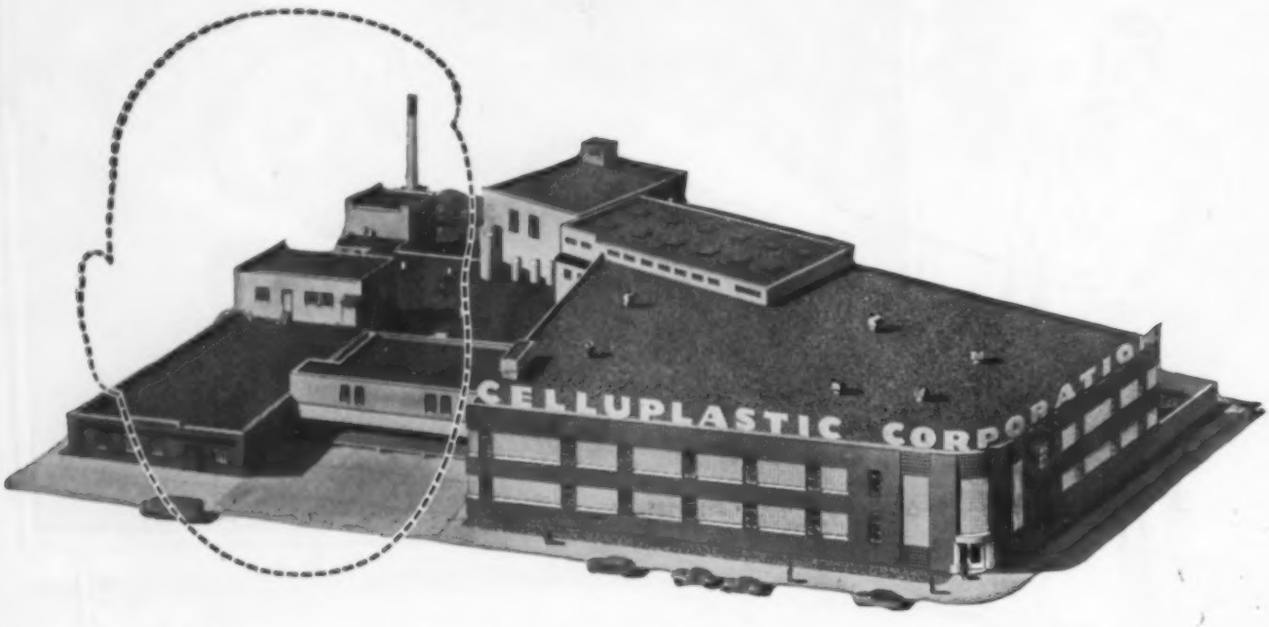
General Offices: AKRON 8, OHIO

California Representative: Sam Kipp, P. O. Box 441, Pasadena 18, Calif.

Plastics MACHINERY DIVISION

EXPORT DISTRIBUTORS: OMNI PRODUCTS CORPORATION, 460 FOURTH AVE., NEW YORK 16, N. Y.

AMERICA'S #1 SOURCE FOR PLASTIC CONTAINERS



One of the world's finest plastics plants offers you its superb facilities for

EXTRUSION AND INJECTION MOLDING

When you become a Celluplastic customer, one of the world's finest plastics plants is at your service—*plus* the engineering skill of long-experienced plastics experts—*plus* the knowledge born of 28 years of specialization in thermoplastics.

We can begin with your *idea*, and quickly prepare perspective drawings . . . blue prints . . . samples of your product. Our equipment is so varied that runs of all quantities, large or small, are handled efficiently and economically.

We have machine capacity up to 22 ounces per shot for injection molding. In extrusion molding, we produce special and standard shapes, both flexible and rigid, in all colors and in all thermoplastics. Among our products are rods, tubes, belts, monofilaments, yarns and furniture webbing. Next time you are in the market for extrusion or injection molding, be sure to *consult Celluplastic*.

Celluplastic Corporation

50 AVENUE L, NEWARK 5, N. J.

PLASTIC CONTAINERS
EXTRUSION AND INJECTION MOLDING

New York office: *Rockefeller Center, 630 Fifth Ave., Circle 6-2425* • West Coast: *Container Service Co., 1266 Northwestern Ave., Los Angeles 27, Cal.* • New England: *Allen-Nelson Co., 603 Boylston St., Boston 15, Mass.*

Simple Arithmetic!

3x1 It's as simple as 3 times 1! 3 times as many inserts per pound from Alcoa Aluminum as you get with heavier metals. Your insert manufacturer can get Alcoa Aluminum Alloys in the stock sizes and shapes he needs for low-cost production.

+ Add the saving you get with reducing rejects due to stresses set up as the molded part cools—stresses that can cause cracks in the finished piece. Aluminum inserts have the same coefficient of expansion as most molding compounds, shrink at the same rate on cooling.

+ Add also the handsome appearance of this light, bright *rustless* metal, available in a wide variety of finishes including bright, satin, silvery, or colored Alumilite.* ALUMINUM COMPANY OF AMERICA, 2175 Gulf Building, Pittsburgh 19, Pennsylvania.

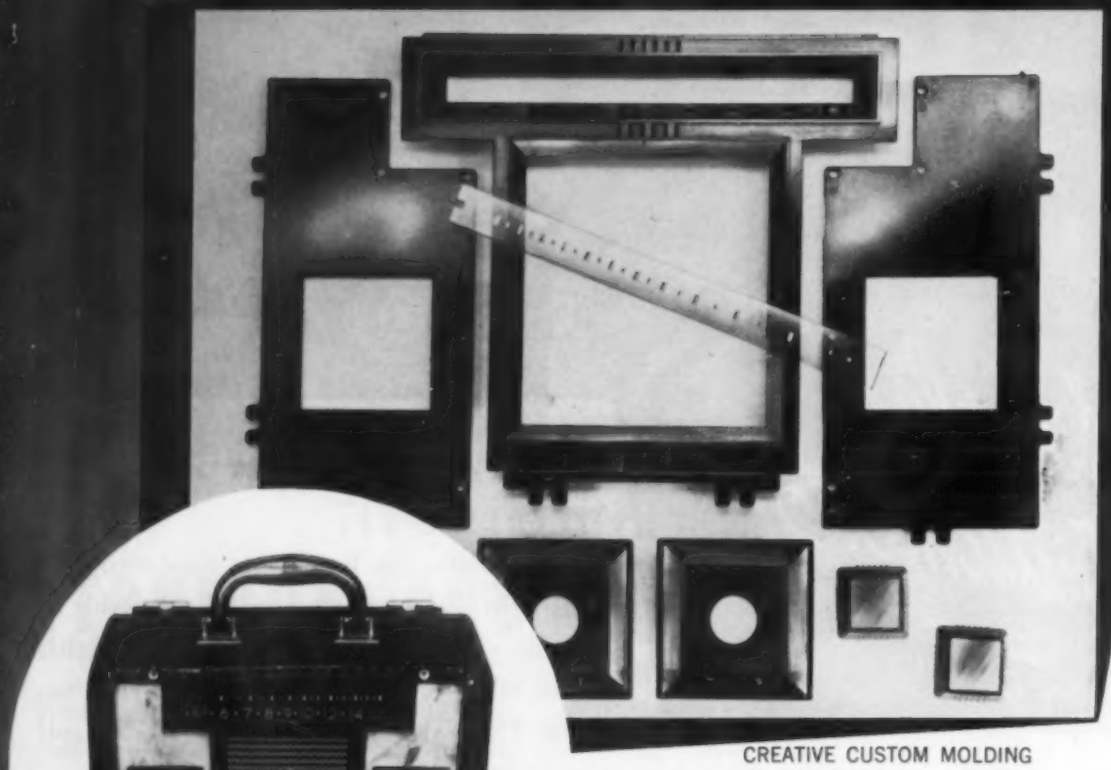
*Patented process

Aluminum-Plastic Teamwork Pays Off!

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM

PLASTICS for INDUSTRY



CREATIVE CUSTOM MOLDING

Illustrated above is an escutcheon for a portable radio set manufactured by Motorola, Inc., one of the nation's leading producers of radio and electronic products.

The molded parts in polystyrene are produced from two dies so that contrasting colors may be achieved. The assembly of the seven parts is accomplished by molded lugs and secured with cement and speed nuts. The dial scale is produced from clear vinylite sheet stock with the calibrations silk screened in gold matching the gold filled portions of the escutcheon.

The molding of plastics for industrial users is Cruver's specialty. Our engineers are available at all times for consultation with the designers and engineers of our customers. We invite inquires.

CRUVER CHICAGO

51st Year in Plastics . .

Cruver

MANUFACTURING COMPANY

2456 W. Jackson Blvd., Chicago, Ill., Seeley 1300

New York – 2 W. 46th St. • Wisconsin 7-8847

After an old wood engraving by T. Burkett

Once more the rapid, fleeting year
Has brought old Christmas to the door;
Come, let us treat him with such cheer
As folks were wont in days of yore . . .

J. BRIDGEMAN

NIXON NITRATION WORKS

Giant size Lincoln Penny. Capacity five hundred pennies. Skillfully engineered thin shell construction. Precision-fitted cylindrical halves, injection-molded of copper-simulated Polystyrene. Assignment required highest quality engraving and processing craftsmanship. Item shown actual size.

BANK ON CONSOLIDATED AS YOUR SOURCE FOR SAVINGS

Consolidated
MOLDED PRODUCTS *Corporation*
309 CHERRY STREET,
SCRANTON 2, PA.
"Your Blueprint in Plastic"

Product development Savings . . . Mold construction Savings . . . Production Savings — At Consolidated all three are industry's dividend! Experience teaches. Knowledge leads to know-how. And, an experienced know-how finds ways to both save and solve. Consolidated-ly speaking, we've been a party to plastics progress since 1874!

Today, when "a small penny saved is a big penny earned," your product planning can gain much from a beforehand discussion with Consolidated's sales engineers and technicians. That, the types of services we render can advantageously fit your requirements is indicated by the fact that Consolidated has climbed in seventy four years — now stands high in the custom confidence of America's foremost manufacturers!

PRODUCT DEVELOPMENT • MOLD DESIGN • MOLD CONSTRUCTION • PLUNGER MOLDING • TRANSFER MOLDING • INJECTION MOLDING • COMPRESSION MOLDING

Branches: NEW YORK, *1790 Broadway* • CHICAGO, *549 W. Randolph St.* • DETROIT, *550 Maccabees Bldg.* • CLEVELAND, *4614 Prospect Av.* • BRIDGEPORT, *211 State Street.*

"We can set 'em up tight without 'skids' ...make a stronger assembly"

say the makers of American KITCHENS STYLED IN STEEL

High-spots from full report of independent investigator of James O. Peck Co., studying assembly savings made in leading plants with Phillips Screws.

★

"HINGES are the weak spots in many kitchen cabinets," explained the purchasing agent for American Central Div.–Avco Mfg. Corp., "But on ours, the hinge is a point of strength, mainly because we use Phillips Screws.

"Tighter Set-up is easy with Phillips Recessed Head Screws. But it's difficult to get the same firm 'bite' in sheet metal with slotted screws because the driver doesn't have the same purchase in the slotted screw as it has in the Phillips Recess. And slotted heads would burr . . . make dangerously sharp edges to cut hands and arms, snag clothing.

"Protects Panels from Driver Gouges. We don't have to worry about driver slippage with Phillips Screws. No patching or repainting to interrupt our assembly.

"Quicker Location of Screw steps up assembly. The instant seating of the driver in the Phillips Recess gets the screw going faster, — and straight, sure driving without worry about slips speeds the whole operation".

Your Assembly Operations Can Benefit by ideas in this report on the American Central Div.–Avco Mfg. Corp. methods, and other reports of assembly studies . . . covering metal, wood, and plastic products. Use coupon.

This is an American Kitchen Cabinet door, getting a hinge that won't loosen in years of opening and closing . . . thanks to the ease with which Phillips Screws can be set up tight without burring, and without driver slips that would gouge the highly finished panel.

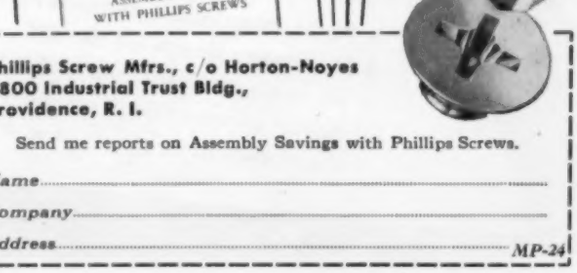
PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Eico Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co
National Lock Co.

24 SOURCES

National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company



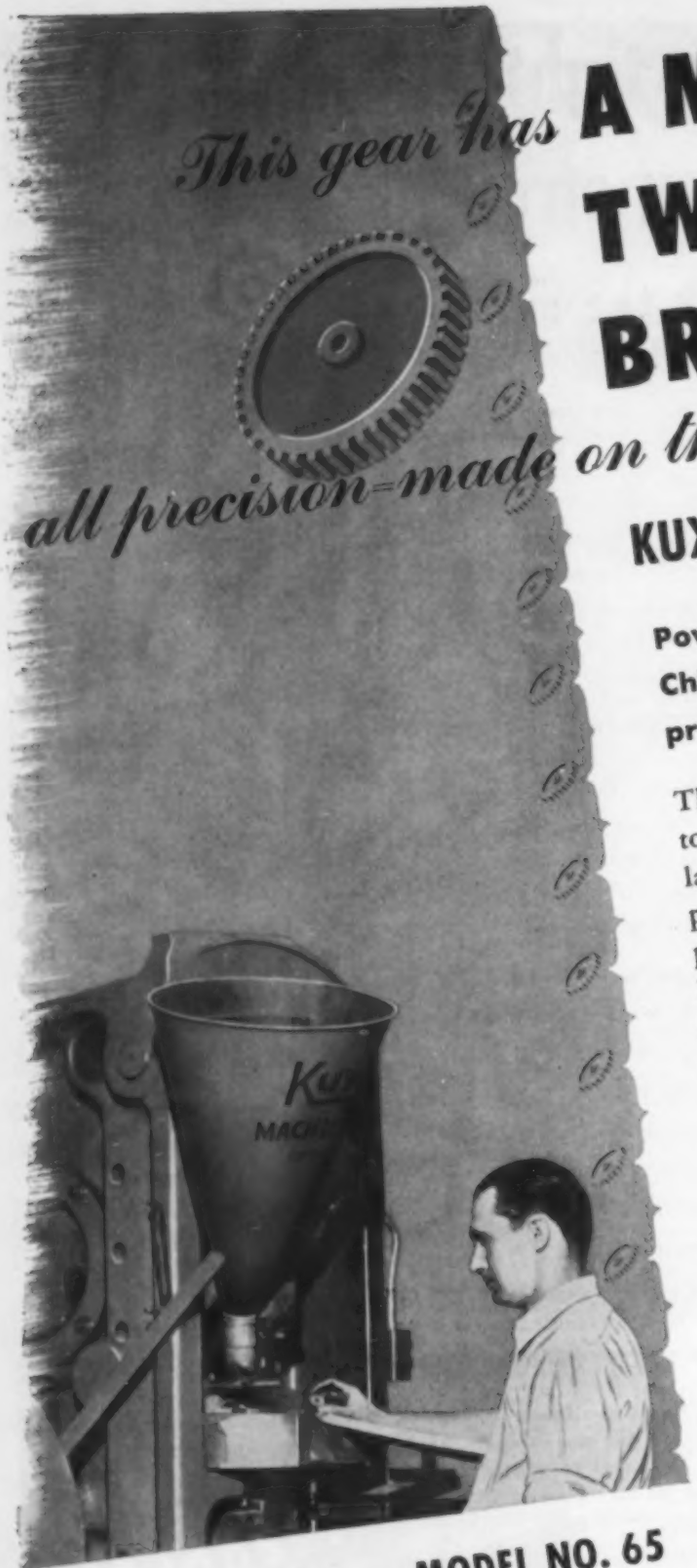
Phillips Screw Mfrs., c/o Horton-Noyes
1800 Industrial Trust Bldg.,
Providence, R. I.

Send me reports on Assembly Savings with Phillips Screws.

Name.....

Company.....

Address..... MP-24



This gear has **A MILLION TWIN BROTHERS**

all precision-made on the powerful

KUX MODEL NO. 65 PRESS

Powdered Metal Products Corporation, Chicago, points with pride to this production achievement.

This small gear had to be held to close tolerances and yet had to be produced in large volume, economically and with utmost precision. PMP solved this problem with powder metallurgy and the Kux Model No. 65 Press. The record stands and speaks for itself. 1,000,000 gears made to close tolerances . . . all identical twins of perfection! Powdered Metal Products Corp. has long been a user of Kux equipment, and thus it was logical for them to depend upon Kux Model No. 65 for a job with such exacting requirements.

Kux equipment can solve your precision production problem too, whether yours be in powder metallurgy, plastics, ceramics or any of the other fields which require high speed, automatic presses.

Write for complete specifications or for demonstration appointment.

Flexible new **MODEL NO. 65**

Single Punch—75 Tons Maximum Pressure

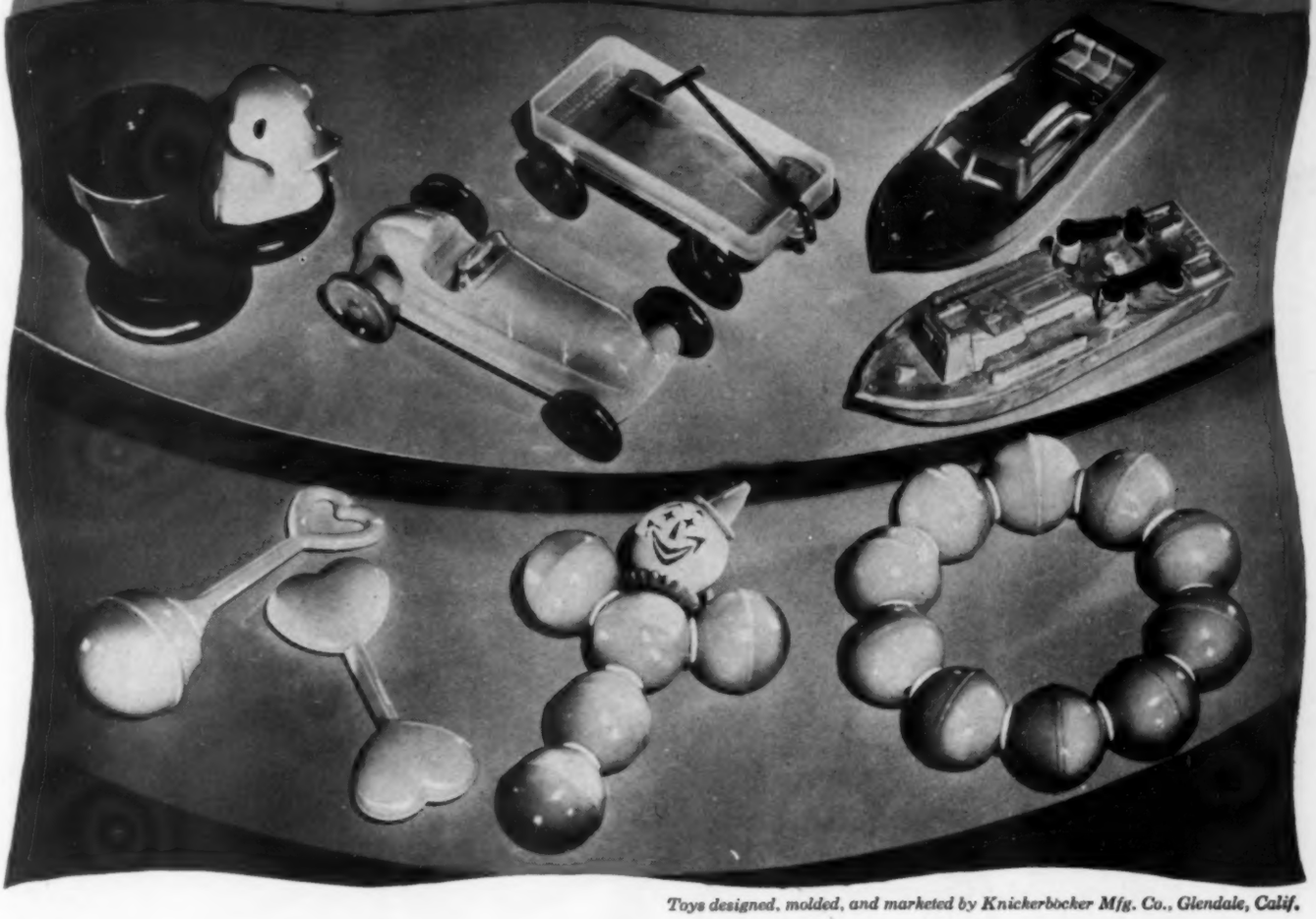
- **Parts, maximum diameter . . . 3″**
- **Maximum depth of die fill . . . 3″**
- **Parts per minute, up to 25**
- **Horse power required, up to 10**
- **Floor space, feet . . . 3 x 4½**

KUX MACHINE CO.

3926 W. Harrison Street

Chicago 24, Illinois

Acetate Toys *LAST* After Christmas!



Toys designed, molded, and marketed by Knickerbocker Mfg. Co., Glendale, Calif.

Toughness is important in children's playthings! Toys should not easily shatter—they should be durable enough to withstand the wear and tear of the Christmas season and provide many additional hours of enjoyment after the holiday excitement has passed. That is why millions of toys continue to be molded from cellulose acetate plastics—*the most economical plastic with this important durability factor!*

For Knickerbocker Mfg. Company, as for hundreds of other leading toy manufacturers, the choice of cellulose acetate brings many additional advantages in both fabrication and use.

Cellulose acetate is tougher than any thermoplastic of comparable price. It *gives* where some materials crack or shatter. As a result, interlocking sections of toys often are securely assembled merely by pressing together. Not being brittle, excess material can be removed after molding without damaging the part itself. Punching, drilling, and other finishing operations can be performed easily.

Economy is an outstanding feature of the cellulosics. Cellulose acetate's toughness enables manufacturers greatly to reduce breakage losses in fabrication and shipment. Cellulose acetate may be molded with much thinner walls than are practical with lower-cost thermoplastics. It flows freely and quickly into intricate molds, and often results in lower initial mold costs and faster molding cycles. Scrap can be processed and reused.

If you want your plastic toys to have the durability and colorability essential to *keep* customers sold, use *cellulose acetate* plastics! While Hercules does not make cellulosic plastics or molding powder, we will be glad to send you helpful technical literature on the Hercules base materials from which they are made.

HERCULES POWDER COMPANY
INCORPORATED
916 Market Street, Wilmington 99, Delaware

CP7-12

Save and Sell with Cellulosic Plastics

CELLULOSE ACETATE • ETHYL CELLULOSE • NITROCELLULOSE


TO ATTAIN excellence in plastic molding, many steps—each an essential part of the whole process—must be followed through accurately and thoroughly.
Every step of the way—designing, mold making, molding, and finishing—calls for the highest skill and experience, plus the proper plant facilities for efficient production. Combined, these operations can result in quality molding... plastics that "measure up" in performance, appearance and cost.
MACK experience and proven methods, plus three completely equipped plants, offer plastic molding that qualifies. Your inquiries are solicited; address Mack Molding Company, Inc., 100 Main Street, Wayne, N. J.
Mack
MOLDED EXCELLENCE
MACK PLANT AT WATERLOO, P. Q., CANADA
MACK PLANT AT ARLINGTON, VERMONT
MACK PLANT AT WAYNE, NEW JERSEY

CONTROL HIGH QUALITY

WITH THE

OLSEN PLASTIVERSAL

The Universal Testing Machine for Tension Compression—Flexure Testing of Plastics

Courtesy of Rohm & Haas Company, Philadelphia, Penna.

Today's Plastics Industry knows that the Olsen PLASTIVERSAL (Universal Testing Machine) plays an important part in their manufacturing programs. Providing dependably accurate records of precision tests on film, sheet, plates or blocks and molded specimens or parts, the PLASTIVERSAL makes possible the comparison, standardization, control and development of plastic materials. When equipped with the Olsen High Magnification Recorder the PLASTIVERSAL easily plots stress-strain curves and detailed analysis.

Simplicity of the PLASTIVERSAL design is your assurance of low maintenance costs, ease of operation, dependability and extreme accuracy — it is engineered to be a versatile instrument for testing both on the production line and in the laboratory.

The PLASTIVERSAL is but one of several Olsen machines designed for the testing of plastics — write today for full information.

TINIUS OLSEN

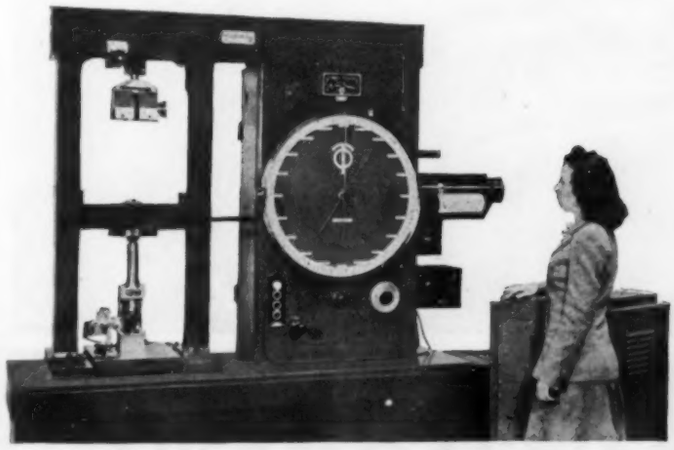
Testing & Balancing Machines

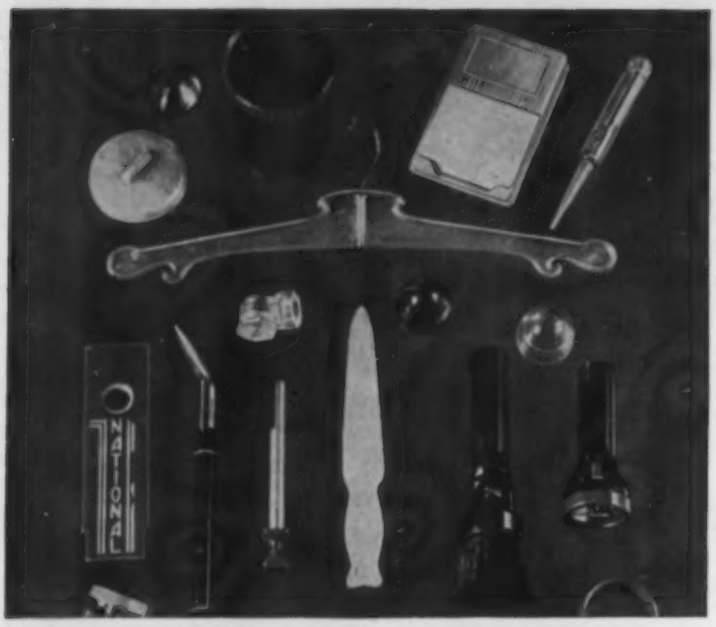
TINIUS OLSEN TESTING MACHINE CO.

580 North Twelfth Street, Philadelphia 23, Pa.

Representatives:

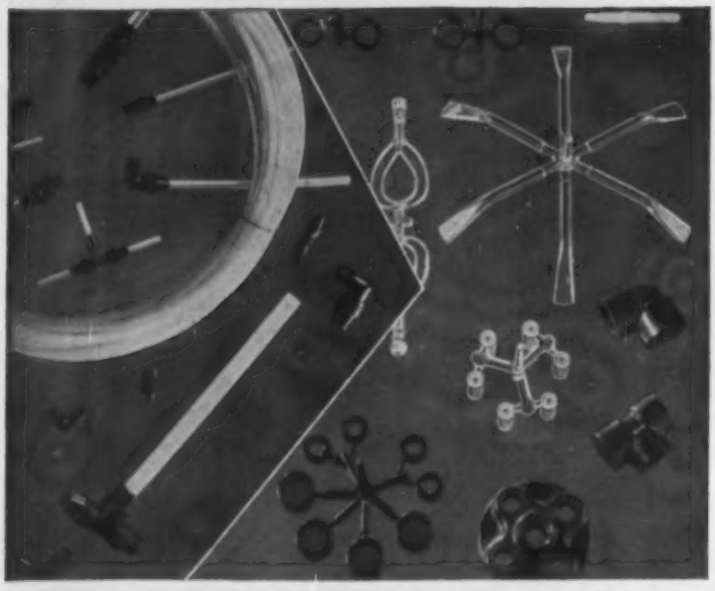
Pacific Scientific Co., Los Angeles, San Francisco, Seattle • Mine Smelter Supply Co., Denver, Colo.





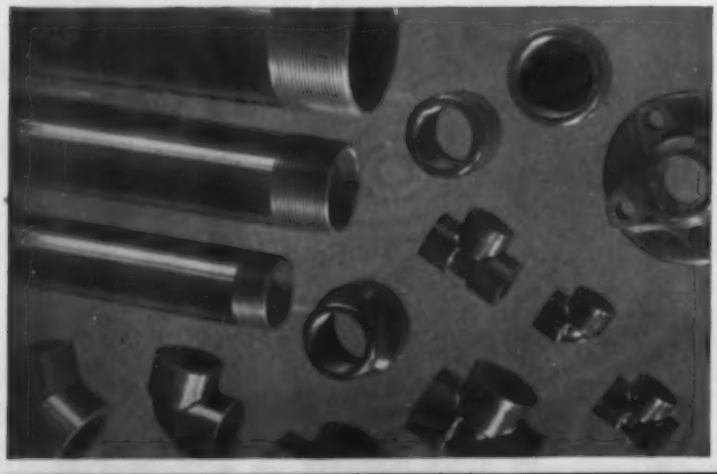
Plastic Parts
OF EVERY DESCRIPTION

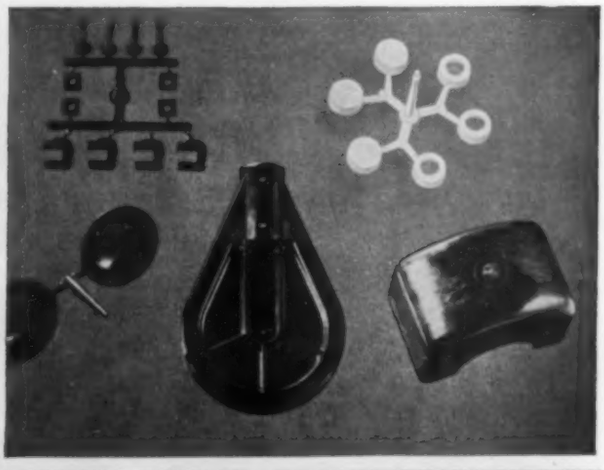
PLASTICS St. Louis



INJECTION MOULDING
EXTRUSION MOULDING
PLASTIC FABRICATION
ENGINEERING COUNSEL

Complete Mould and Tool Shop





ST. LOUIS PLASTIC MOULDING CO.
SAINT LOUIS 8, MISSOURI

Better Handling OF HOSIERY IN THE MILL!

FORMICA trays and hosiery carriers especially designed for handling hosiery during the manufacturing processes, save time — and, still more important, prevent the creation of many seconds. A much larger percentage of the product comes through as firsts saleable at the full manufacturer's price.

That difference quickly pays for the Formica equipment.

Both the tray and the carrier have been designed with sturdy reinforcing ribs to provide maximum strength with minimum weight. Design has been very carefully worked out to prevent shattering of edges so there are never any rough places on which fine fabrics can be snagged.

The trays and carriers are very smooth when you get them, and, because of the nature of the material and the design, they stay that way through long years of service.

This is equipment that really saves the knitter money!

FORMICA

TRADE MARK REG. U.S. PAT. OFF.

THE FORMICA INSULATION CO., 4668 SPRING GROVE AVE., CINCINNATI 32, OHIO

SALT ON YOUR POPCORN?

To give you just the right amount is the function of the salt dispenser molded by Shaw for the Viking Tool and Machine Company's popcorn dispensing machine. To reduce molding costs on a part like this is a feature of the Shaw service.

Public use of this salt dispenser demands that it look right and be able to take it. A general purpose phenolic is the ideal material. The problem is to mold it to meet the requirements of use at a low enough cost. Design complications in the Viking piece, such as the side cores and deep holes, dictated the use of Transfer molding — a Shaw development — as the most economical and efficient technique.

A two-cavity auxiliary ram Transfer mold was employed. Not only was it possible to produce the part on a very fast molding cycle, but finishing expenses were cut.

Shaw's ability to bring out the maximum advantages of plastics at a minimum of cost is at your command. Take advantage of it by assigning your plastics molding problems to Shaw.

SHAW

SHAW INSULATOR COMPANY

MOLDERS QUALITY MARK ON MOLDED PLASTICS SINCE 1892

160 COIT STREET IRVINGTON 11, N. J.

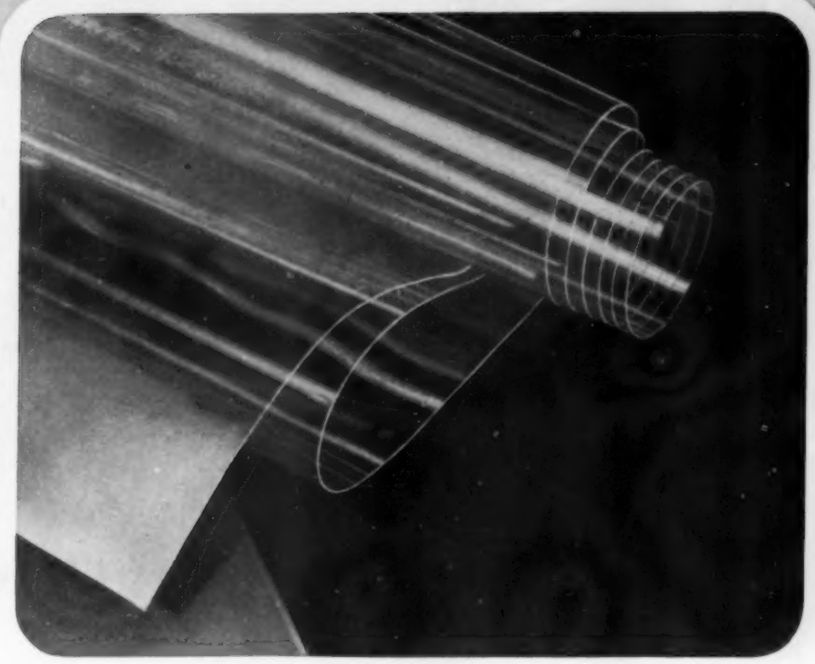
PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

THE PLASTIC FOR IDEAS



Plax polystyrene products offer you versatile media in which to work out ideas in plastics. Readily adapted to many manufacturing processes, polystyrene can be formed, punched and machined. You can have it in rod, tube, fiber or sheet forms —and in special variations of these forms. You can have it "water clear," or in color.

The uses of Plax polystyrene products have already gone beyond the tabulation point. In sheet form, it is being used for electrical insulating purposes, for packaging, and for all sorts of novelties. Tubing is used for medical equipment, furniture, high frequency electrical applications, chemical pipe. Rod is just as widely used.

Plax polystyrene forms most likely can be adapted to many of your own new ideas. Complete technical literature is yours for the asking.

CHART ON "HOW TO USE PLASTICS"

Now available for the asking is a table of properties for six materials available from Plax in various forms and formulae. This has been incorporated in the Plax catalog, which also contains helpful information on the primary uses of each material.

A copy will be sent promptly upon receipt of your request.

Between the resources of Shaw Insulator Company, Irvington 11, N. J., and Plax Corporation, Hartford 5, Conn., you can find help on virtually every material and method in plastics today.

PLAX
FOR PLASTICS
NOT SUBSTITUTES···IMPROVEMENTS

133 WALNUT STREET ★ HARTFORD 5, CONNECTICUT
In Canada – Canadian Industries, Ltd., Montreal

No "HAND-ME-DOWNS" at MOSINEE

It is the MOSINEE policy to create *custom-made* papers *only* . . . custom-made to fit our *customers' specific requirements.* There are no "stock runs" of general-purpose papers at MOSINEE . . . no "hand-me-downs" or attempts to sell you a standard paper rather than the "made-to-order" type that is essential to the functions you want paper to perform in your products and processing.

MOSINEE paper technicians cooperate in determining *what* you need in paper, and *how* you can process it best . . . then MOSINEE makes paper according to *your* needs. MOSINEE has the experience plus scientific and production controls for moisture repellency, specified dielectric strength, high tensile strength, folding, maximum-minimum pH and other vital characteristics of modern industrial papers.

That's why many manufacturers rely on MOSINEE as a dependable source for industrial papers.

MOSINEE PAPER MILLS COMPANY

MOSINEE • WISCONSIN

Essential Paper Makers

Please address your letter "Attention Dept. A"

Production facilities for the Proctor Iron Handle. Pre-Heater is the THERMALL CHAMP.

HEATABILITY	5 lbs.
HEIGHT (work level)	44"
WIDTH	20"
DEPTH	30"

GENERAL PURPOSE PRE-HEATER

THERMALL

H. F. PREHEATERS

"...a new high in efficiency"

Another big molder writes of satisfaction with THERMALL's without-fail efficiency. PLASTIC MANUFACTURERS, specialist in the most modern types of precision molding, relies **EXCLUSIVELY** on THERMALL Pre-Heaters for versatility and high speed at volume production level . . . typical of THERMALL's acceptance throughout the world.

PM

PLASTIC MANUFACTURERS *says:*

"Our production of Proctor Iron Handles depends on THERMALL Pre-Heaters exclusively. THERMALL Pre-Heaters have enabled us to develop transfer and compression molding to a new high in efficiency and adaptability."

WRITE FOR DEMONSTRATION

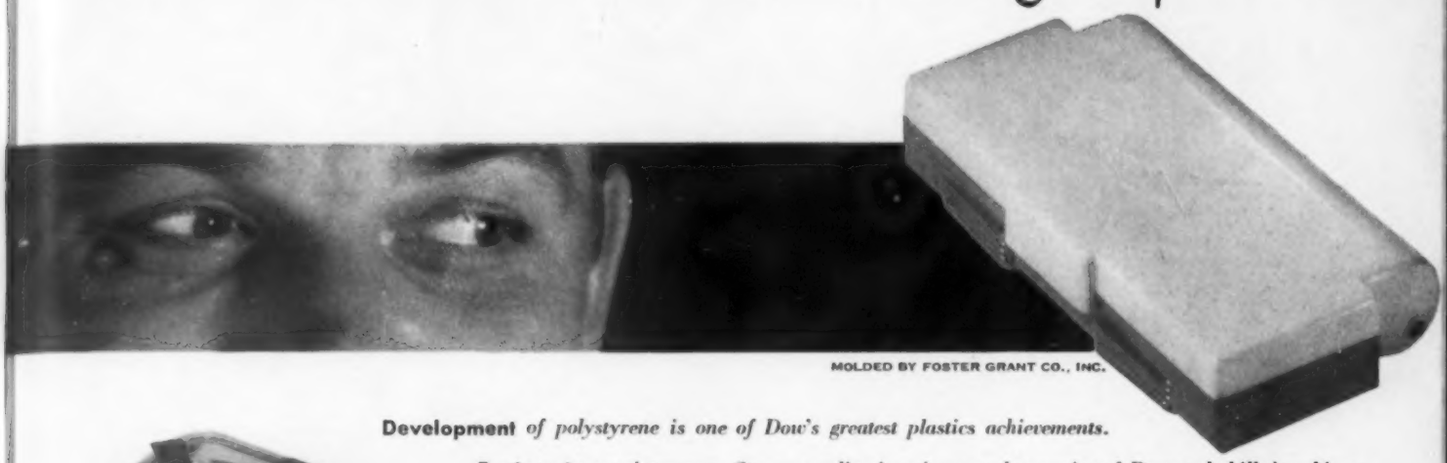
Anywhere in the world

THERMALL

ELECTRONIC HEAT GENERATORS

Manufactured by
W. T. La Rose & Associates, Inc.,
Troy, N. Y. U.S.A.

STYRON . . . the right plastic!



MOLDED BY FOSTER GRANT CO., INC.

Development *of polystyrene is one of Dow's greatest plastics achievements.*

Engineering *assistance on Styron applications is a regular service of Dow and skilled molders.*

Production *capacity of Styron (Dow polystyrene) has expanded 10 times over prewar.*

MOLDED BY TRI-STATES PLASTICS CO., AFFILIATED WITH RUZAK INDUSTRIES

Right in the public eye!

"We prefer plastics in so many things!"

"Packages in colorful Styron are certainly eye-catchers," say Sue and Jack Hoffman of Los Angeles, California. "And those plastic containers not only keep products fresh, but serve a dozen other purposes all over our house. We're enthusiastic shoppers for new things in plastic."

HERE IS PACKAGING at its exciting best! Styron (Dow polystyrene)—a brilliant plastic—brings *three-fold* sales appeal to the newest containers . . . eye-tempting beauty, dependable protection, and lasting utility. Gay and colorful . . . and sturdy as they are beautiful . . . they're packages of many active lives. There's a definite distinction about Styron packages that makes them sales winners wherever they appear. That's why Styron is inspiring refreshing ideas in a wide variety of new packages.

Styron's outstanding qualities make it a favorite basic material in a host of other products, too—from containers and housewares to radios and refrigerators. Wherever you meet this No. 1 plastic, you'll find it's *right* in the public eye!

Plastics Division
THE DOW CHEMICAL COMPANY, MIDLAND, MICH.
New York • Boston • Philadelphia • Washington
Cleveland • Detroit • Chicago • St. Louis • Houston
San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Ontario

DOW Plastics

Saran BY NATIONAL monofilaments

WEAVING COLORFUL BEAUTY INTO FABRICS THAT ENDURE

For the textile industry SARAN is a promise fulfilled. Fabrics created from these tough, flexible strands are the inspiration for numerous upholstery and drapery applications. They can be seen today in actual service—in hotels and restaurants, theatres and public transportation, in furniture for the home and in the finest automobiles. In diameters as fine as .005", Saran monofilaments have been woven into patterns and textures of infinite beauty. Dirt and chemicals leave them unharmed. Their resistance to wear is unique in the field of textiles.

Let us tell you more about this growing swing to SARAN!

SARAN BY NATIONAL denotes monofilament, tape and rattan manufactured by The National Plastic Products Company of Saran, a vinylidene chloride copolymer made by The Dow Chemical Company and supplied to mills, weavers and other fabricators for specific end uses.

TRADE MARK REG. U. S. PAT. OFF.

The NATIONAL Plastic Products Company

ODENTON • MARYLAND

NEW YORK: EMPIRE STATE BUILDING • LOS ANGELES: BANKERS BUILDING

The Auburn Plastics News

NATIONAL EDITION

VOL. I NO. 6 AUBURN BUTTON WORKS, INC., AUBURN, N. Y. BI-MONTHLY

NEW PLASTIC HANDLES CREATE SENSATION

HANDLE HAS NEW SCIENTIFIC DESIGN

A new-type, scientifically designed handle for any product requiring lifting, pushing, or pulling has created a real sensation in every branch of industry where it has been introduced.

It is said to be the first handle of its type to be granted a mechanical patent in the long history of the United States Patent Office. Its patented features can be included in the design of the handle for any application.

Relieves Muscular Strain

Designed by Thomas Lamb and called the Lamb "WEDGE-LOCK" Handle, it is primarily intended to relieve muscular strain of hand and arm by enforcing relaxation of the thumb, and by equalization of stress and strain over the whole hand, which in turn eliminates painful strain and tension on arm muscles and ultimately back muscles. It painlessly puts the thumb muscle to work. It can be used in either the right or left hand with equal facility.

Scientific Weight Distribution

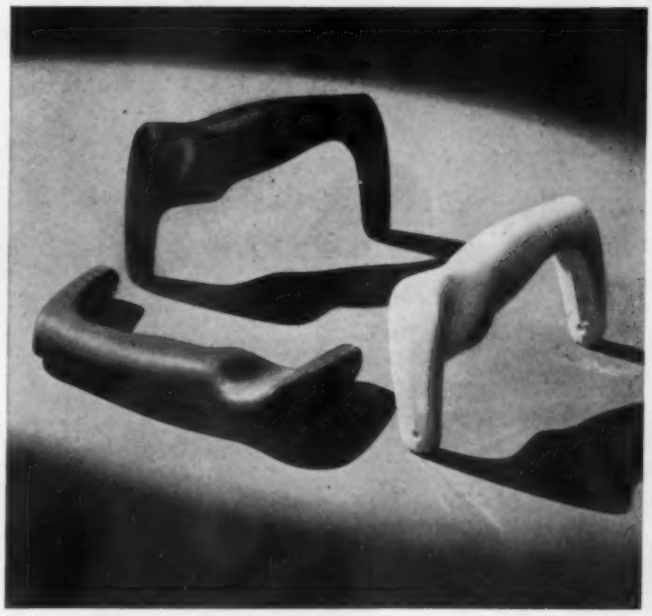
Another interesting feature incorporated in the "WEDGE-LOCK" design is a more efficient distribution of the weight effected by setting the handle on a 15° angle, much the same as a man carries a heavy crow-bar on a slight angle rather than parallel to the ground, which angle, in conjunction with other curves, wedges and divisions in the handle, reallocates the rightful strength to each finger, forcing each finger to do only its share of work.

Increases Luggage Sales

Luggage salesmen report that the new handle makes lifting seem twice as easy and most customers feel that they can lift twice as much or carry the same weight twice as far.

Molded for Standard Handle Co.

Auburn is molding the luggage handle of polystyrene by the injection method . . . for the Standard Handle Company. Such polystyrene properties as being pleasing to the touch, acid-resisting (no perspiration stains) and unlimited color possibilities, make it ideal for this application.



Design of the Lamb "WEDGE-LOCK" Handle makes the thumb relax and allows the hand and arm to work in unison, thus avoiding the tension that results in muscular strain.

THOMAS LAMB HAS INVENTED HANDLE

Industrial designer, Thomas Lamb, invented the "WEDGE-LOCK" Handle after a long study of anatomy in which he developed the principles that he incorporates in his design.

Lamb first became interested in the idea during the War, when he was developing a crutch handle to ease the strain on shoulders and hands. Lamb, after considerable research, produced a new type of crutch which met all requirements.

His next assignment was to solve the problem of how many left-hand or right-hand crutches were going to be needed. This resulted in the development of his now-famous universal handle.

The "WEDGE-LOCK" Handle required 6 years of intensive research and experimentation. Thousands of studies of hands (shape and function) were made; hundreds of models were designed and tested; and over 700 pairs of human hands were examined, measured, and tested on models and apparatus.

HANDLE SIMPLIFIES PRESSURE COOKING

A new Lamb "WEDGE-LOCK" Handle mold for pressure cookers is already in production at the Auburn Button Works.

Embodying all the basic, scientific features of the "WEDGE-LOCK," this handle will simplify the mechanical side of pressure cooking by allowing the housewife to lift the entire unit with one hand rather than two . . . with far less effort than is normally required.

The easy control afforded by the handle makes it ideal for this application. Its safe operation minimizes some of the fear complexes which have retarded the sale of some pressure cookers; namely, worry about heat, steam, hot liquids, and excessive weight.

Auburn will mold this handle of asbestos-filled phenolic for its touch and safety advantages.

UNLIMITED POSSIBILITIES FOR NEW HANDLE, INQUIRIES WELCOMED BY AUBURN

The Lamb "WEDGE-LOCK" Handle is so flexible in its adaptation that it can be used on any product that must be pushed, pulled or lifted.

Handle molds are now in the making for ladies' hair brushes, stovetop ware, acetylene torches, and glass coffee makers. The design will find its way to portable electric tools, portable radios, boxes, carrying cases of many types and hand tools.

If you think that your product can be made more functional or more salable with this new handle, you can get further details from Auburn Button Works, Inc., authorized molder. Auburn engineers will be glad to process your inquiries and submit cost data for your information.

You can expedite matters by sending a sample of your product with full details on all handle requirements. A prototype of the "WEDGE-LOCK" Handle can be designed for your particular application and you can see for yourself how much it will add to the unit.

NEW DESIGN USED IN SKILLET HANDLES

Auburn is molding a unique "WEDGE-LOCK" skillet handle that is sure to prove a boon to the busy housewife.

Made of an asbestos-filled phenolic material by the plunger-type transfer method, this new handle withstands high temperatures and, at the same time, enables the skillet to be lifted safely and easily with unusually heavy contents. Even if greased, handle will not slip or turn in hand.

AUBURN MARKS 72nd YEAR IN PLASTICS

Founded in 1876, the Auburn Button Works is rounding out its 72nd year as a plastics molder. Its growth has paralleled that of the plastics industry itself.

Today, Auburn molds all types of plastics by any molding method. When you choose Auburn as your custom molder, you can be sure that the recommendations of their engineers are not dictated by any limitation of plant or molding facilities.

OFFICES: NEW YORK AND CHICAGO. REPRESENTATIVES: NEW ENGLAND, PHILADELPHIA, CLEVELAND, DETROIT, SAN FRANCISCO

first to develop a corrugated LUGGAGE box

CORRUGATED BOARD, long noted for its packaging utility value, can go "ritzy" too. H & D proved it by developing the first corrugated luggage box.

Smart, sturdy and lightweight, the richly grained "airplane style" corrugated luggage box has since been adapted to a host of repeat-use applications—from ice skates to camping equipment to children's coloring kits.

H & D is noted for "firsts"—the first package laboratory, the first corrugated canned-food box, the first corrugated shipping-display box, many others. Thus H & D serves industry well by reducing transit damage losses, by lowering shipping costs and by making products more attractive and salable through better packaging. The Hinde & Dauch Paper Co., 4711 Decatur Street, Sandusky, Ohio.

LOOK TO
REG. U. S. PAT. OFF.
H&D
FOR PACKAGING
"firsts"

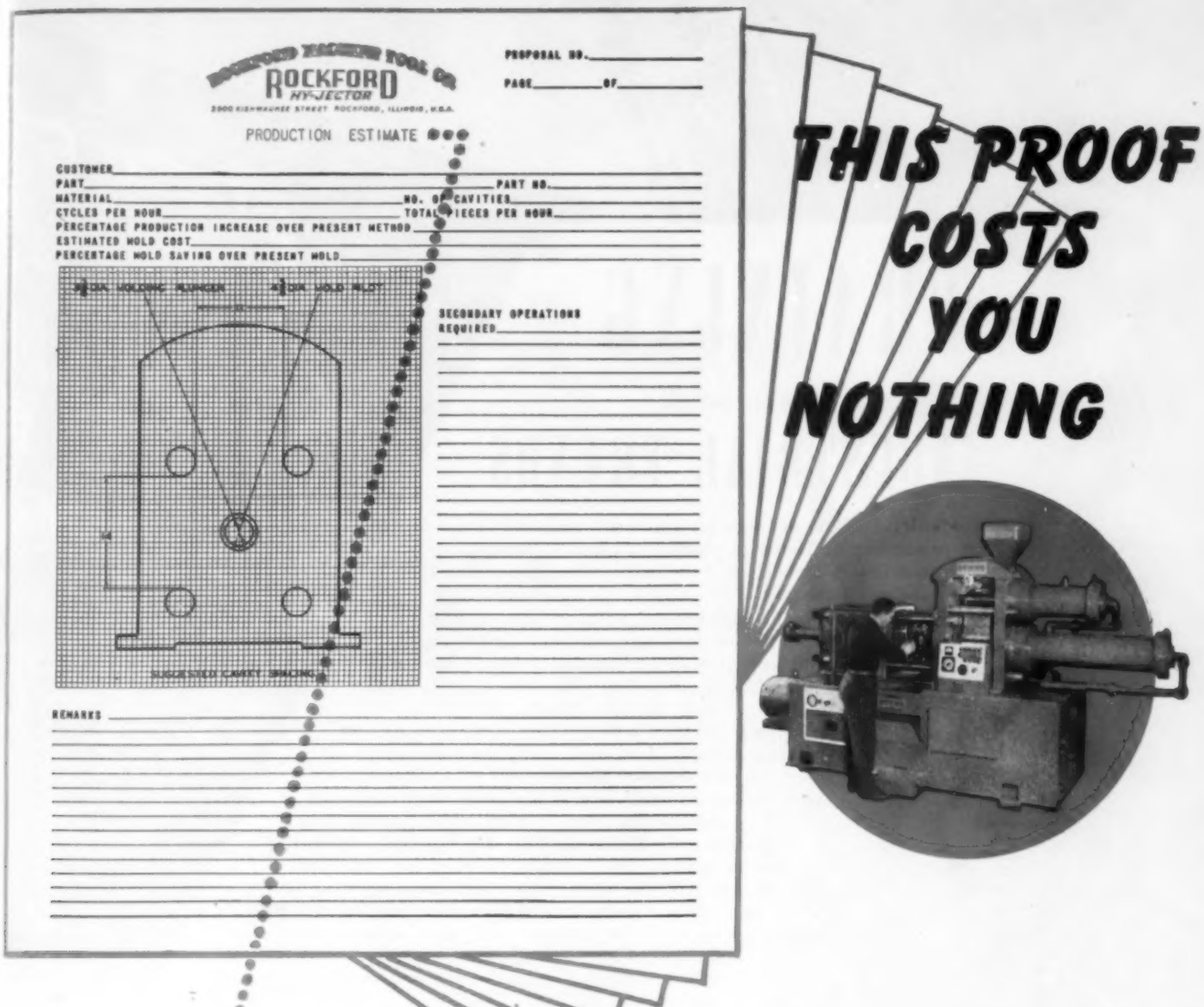
HINDE & DAUCH · *Authority on Packaging*

FACTORIES IN: Baltimore 13, Maryland • Buffalo 6, N. Y. • Chicago 32, Illinois • Cleveland 2, Ohio • Detroit 27, Michigan • Gloucester, N. J. • Hoboken, N. J. Kansas City 19, Kansas • Lenoir, N. C. • Montreal, Quebec • Richmond 12, Virginia • St. Louis 15, Missouri • Sandusky, Ohio • Toronto, Ontario • Boston, Mass.

Pyro

PLASTICS CORPORATION

CHESTNUT STREET AT ROUTE 29
UNION, UNION COUNTY, NEW JERSEY



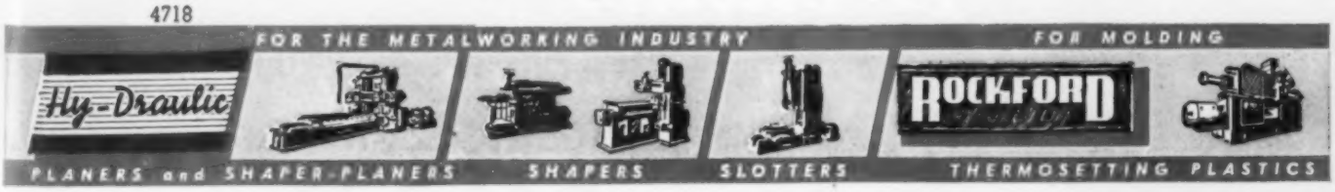
THIS PROOF COSTS YOU NOTHING

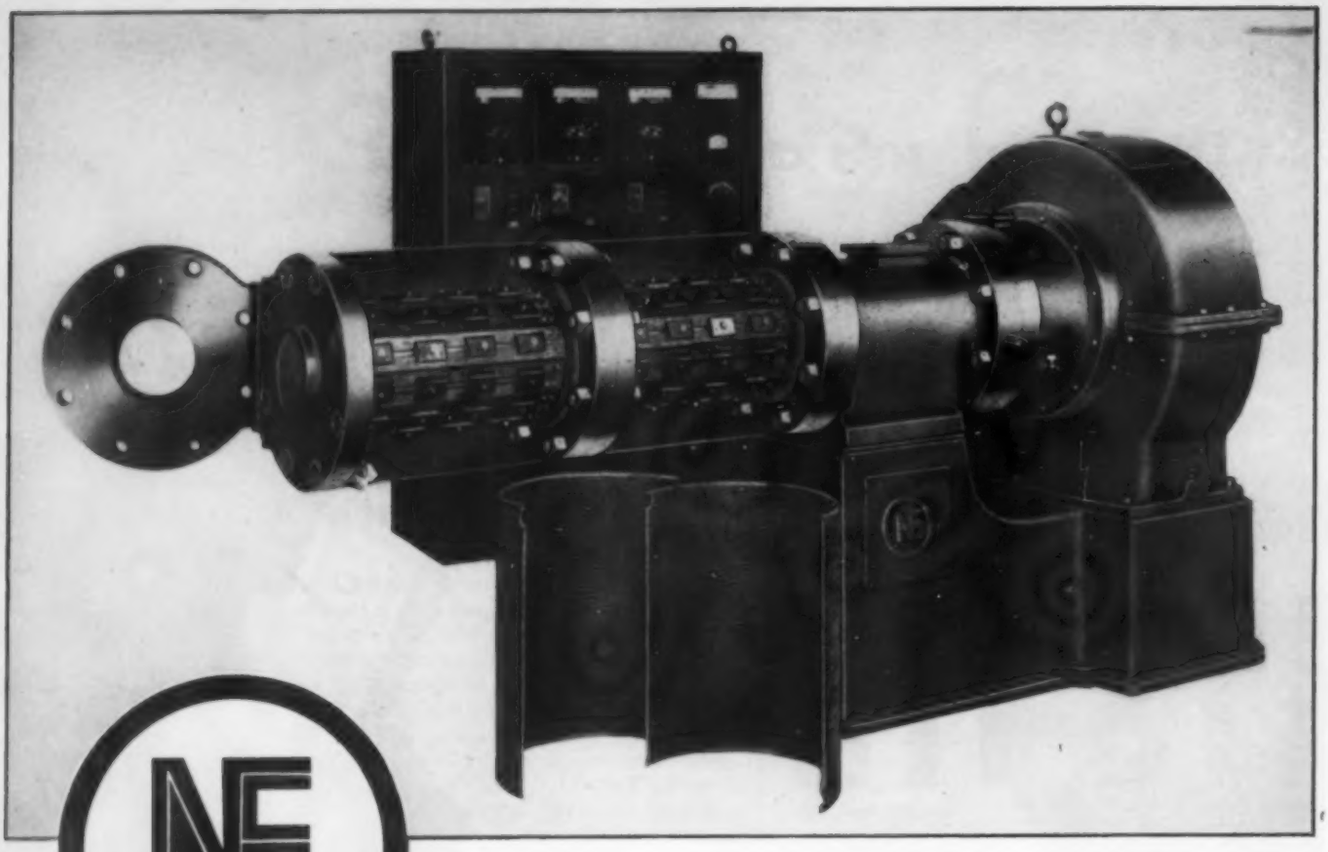
Will you accept an offer that will show how your production costs might be lowered thousands of dollars per year where THERMOSETTING MATERIALS are used? The production estimate Rockford engineers can supply will cost you nothing. The estimate supplied will be for your production as it can be done on the new ROCKFORD HY-JECTOR . . . the first fully automatic machine for the combined high speed operations of pre-forming, pre-heating, and molding. You are not obligated to buy if you accept this engineering service; but we think you may want to buy, once you have the production facts before you. Just send us your name . . . a Rockford engineer will outline the information needed to make your ROCKFORD HY-JECTOR production estimate.

WRITE FOR THE ROCKFORD HY-JECTOR PRODUCTION ESTIMATE

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

4718





NE *presents* NEW LINE OF ELECTRICALLY HEATED EXTRUDERS—THE ANSWER TO PROCESSING HIGH TEMPERATURE PLASTICS

NE Products

EXTRUDERS
STRAINERS
HYDRAULIC PRESSES
MIXING MILLS
LABORATORY PRESSES
SIMPLEX DOORS for Pressure Vessels
STEEL CASTINGS and GEARS to Any Specifications.

THE above NE extruder features direct contact, electrically heated cylinders for the extrusion of high temperature plastics—up to 750° F. This electrical method provides clean and safe operation over a wider temperature range than is possible with any other heating medium. More accurate control and more uniform heat application throughout the cylinder is possible with this method. It is adaptable to any extruder. Consult with NE engineers for recommendations on electric heating for your extruders.

• *Write for copy of our general catalog that fully describes NE Extruder's 5-unit construction.*

NATIONAL ERIE CORPORATION
ERIE, PENNSYLVANIA • U. S. A.

Look what's behind this Resproid curtain!

THERE'S more to making plastic these days than just buying resins, plasticizers, coloring matter and filler, and running them through a calendering machine.

And it takes much more to make a plastic as good as *Resproid* — with *Resproid's* lasting beauty — with *Resproid's* long flex life — with *Resproid's* superior resistance to scuffing, fading, cracking and abrasion, to wear and deterioration of all kinds.

One of the things it takes is vinyl resins of a high molecular weight. Another is modern equipment, because only the *most* modern can process these high weight resins into a plastic good enough for your shower curtains, luggage, furniture upholstery, handbags, waterproof garments — whatever you make.

The third ingredient in *Resproid* quality is the "know-how" that comes from long experience and years of laboratory research. The fourth is integrity. The highly desirable properties of vinyl resins can be completely destroyed by either lack of experience or the temptation to profit by adulterization. These resins are markedly affected by the type of plasticizer, the amount and type of coloring matter and filler, and the character of the processing.

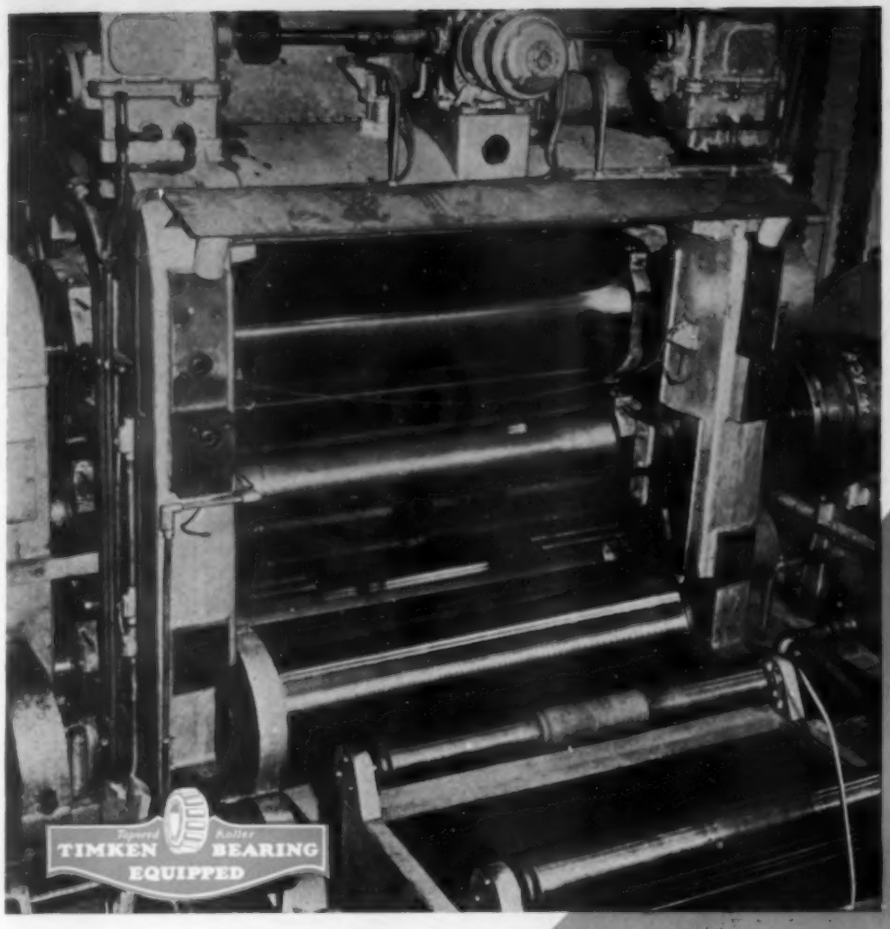
The quality of plastics is not recognizable by superficial examination. But if you will keep in mind all that lies behind every roll of *Resproid* whenever you buy plastics, you will not mistake hardness and brightness of surface alone for the quality your products deserve.

Your surest guarantee of this quality is the name *Resproid.*

Guaranteed by Good Housekeeping

CRANSTON 10, Respro INC. RHODE ISLAND

Genuine Resproid Plastic

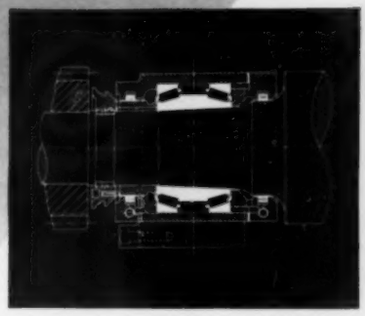


Holds to a Tolerance of Plus or Minus 10% Rolling .004" "VINYLITE" Plastic Film

With the rolls mounted on Timken Balanced Proportion Tapered Roller Bearings, the Dominion-built calenders at the plant of Canadian Resins And Chemicals Ltd. roll "Vinylite" plastics film 48" wide x .004" thick, holding to a tolerance of plus or minus 10% on thickness throughout the length and width.

That's a tough test for any calender. The close precision tolerances to which Timken Bearings are made plus adjustability of the bearings to any desired preload, assure accurate and constant gap setting between rolls with resulting close control of product thickness. Furthermore, the calender rolls can be ground on the bearings, making the O.D. of the rolls virtually free from inaccuracies.

To assure best results in calenders, mills, extruders or any other kind of plastics equipment, look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.



Application of Timken Bearings on the roll necks of the calenders built by Dominion Engineering Company Limited, Montreal, Quebec for Canadian Resins And Chemicals Limited.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂ BEARING TAKES RADIAL ⊃ AND THRUST →⊃← LOADS OR ANY COMBINATION

HERE'S HOT MOLDING NEWS

YOU CAN NOW HAVE

HEAT

WHERE IT'S NEEDED

Complete, Independent Heat Control of Injection Cylinder Walls *and* Internally Heated Torpedo Transforms former "Thermal Vacuum" Area into new Fountain of Energy resulting in FAR GREATER PRODUCTION!

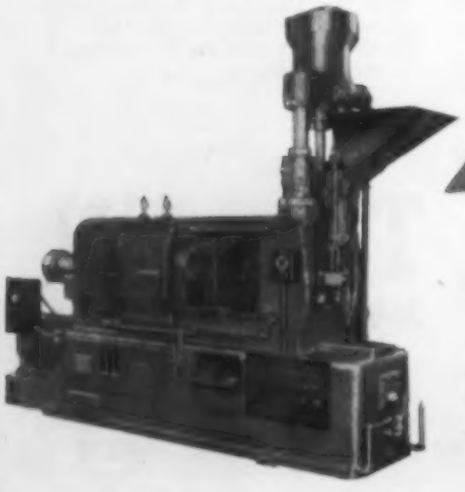
Here is a significant statement of fact!

The new Lester Injection Molding Machine, with its perfected independent control of injection cylinder and spreader temperatures, will plasticize *all* thermoplastic material more rapidly and effectively than *any other* type of plastic molding equipment on the market.

And here's why!

Through internal heating the torpedo or spreader comes *alive* — transfers uniform heat to the plastic granules within the cylinder. Thus "heat lag" is sharply reduced and subsequent heat dissipation through the cylinder walls. Spreader temperatures are controlled within + or − 2° . . . an additional safeguard against contamination, bubbles and weld marks. Slots, holes, and thin metal sections have been eliminated thus providing a free, unobstructed flow of material from the loaded hopper through the cylinder to the die . . . consequently resulting in faster plasticizing and *greatly increased production.*

Write today for *Complete* data on the *new* Lester Injection Molding Machines with independent Temperature Control of internally heated spreader. There is no obligation.

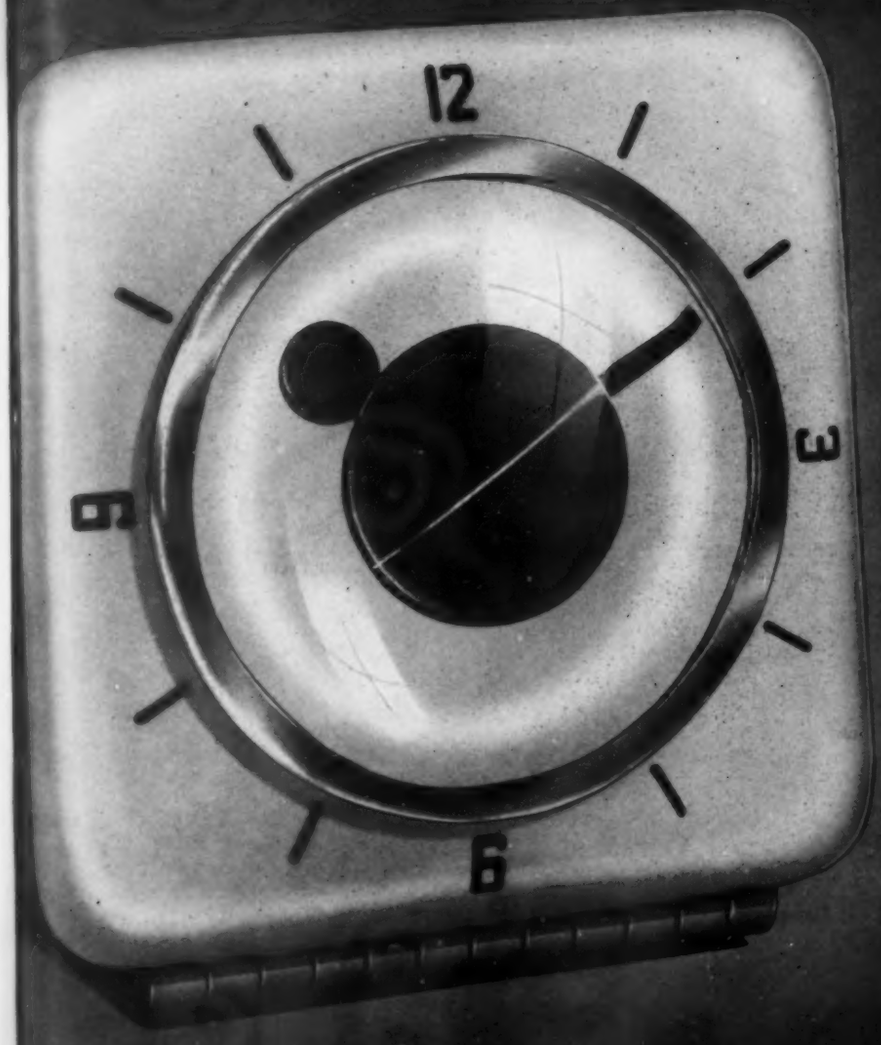


LESTER

INJECTION MOLDING MACHINES

DISTRIBUTED BY **LESTER-PHOENIX, INC.** 2621 CHURCH AVENUE CLEVELAND 13, OHIO

DON'T OVERLOOK CASTINGS!



This striking McClintock clock owes much of its beauty and successful sales record to its brilliant cast resin case turned out by Creative in large volume. It is concrete proof that it is wise to look beyond ordinary molding and fabricating methods.

CASTINGS BY *Creative*
offer you these advantages:

INEXPENSIVE MOLDS • INTRICATE PARTS • UNSURPASSED FINISH • RICH COLORS • HEAVY SECTIONS

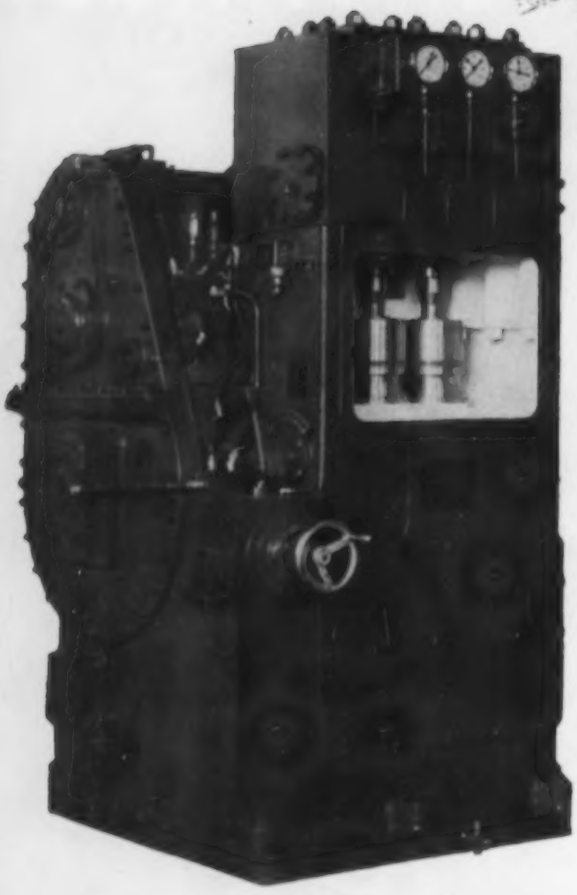
PLASTICS SPECIFICATION QUIZ
Are you looking for a case, panel, or just a knob? Send for the famous Creative Quiz. In two minutes you can tell us what we need to know about your product to permit our engineers to decide what plastic and what method you may require —if any.

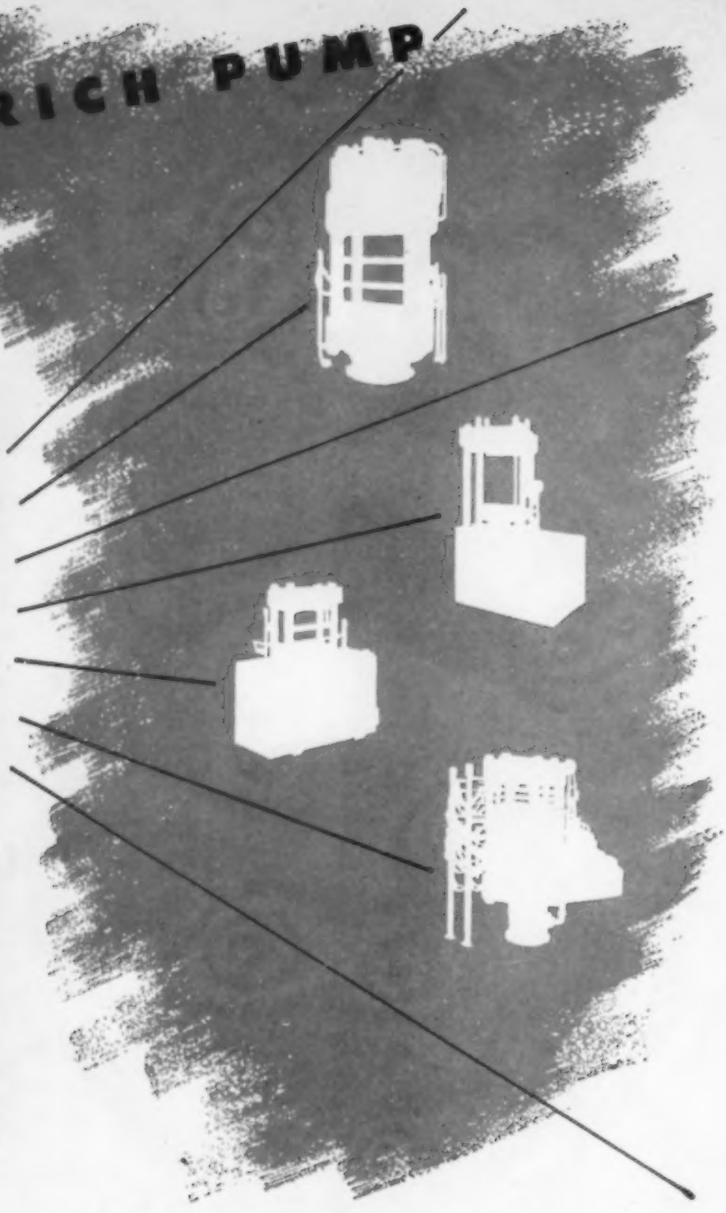
Creative

PLASTICS CORP.

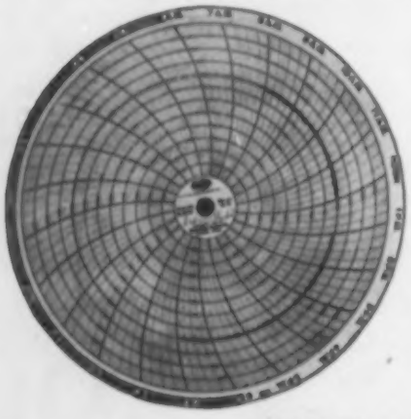
967 KENT AVE., BROOKLYN 5, NEW YORK

USE *One* ALDRICH PUMP





For All Your Plastic Molding Presses



With one ALDRICH-GROFF "POWR-SAVR" PUMP, you can provide uniform hydraulic pressures for all your plastic molding presses and obtain the higher efficiency of a centralized hydraulic system at the same time.

The ALDRICH-GROFF "POWR-SAVR", a variable stroke, constant speed, variable capacity pump, will handle any free-flowing liquid—can be automatically controlled to provide stepless, straight-line variation from zero to rated maximum output. Working pressures up to 15,000 psi can be maintained and variance will not exceed 5% of that desired.

Centralize your system—you get compactness, quick accessibility, easy maintenance and greater economy. Write for technical details to—

THE ALDRICH PUMP COMPANY

6 GORDON STREET, ALLENTOWN, PA.

ALDRICH

Representatives: Birmingham • Bolivar, N. Y. • Boston • Chicago • Cincinnati • Cleveland • Denver Detroit • Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh Portland, Ore. • Richmond, Va. • Spokane, Wash. • Syracuse • St. Louis • San Francisco • Seattle • Tulsa

ALDRICH, THE FIRST NAME IN VARIABLE CAPACITY PUMPS

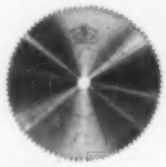
DISSTON CUTTING TOOLS

. . . for faster, better cutting of plastics . . . and for longer tool life

DISSTON CIRCULAR SAWS

Disston makes a complete line of circular saws for the cutting of all types of plastics from thin wall tubing to highly abrasive laminated materials.

SOLID TOOTH



Disston Solid Tooth Circular Saws are supplied with set teeth, hollow ground or a combination of both . . . in four different steels, tempered either for filing or grinding. Also supplied fitted with tungsten carbide tips. There is a wide variety of teeth patterns, each designed to meet definite plastics cutting needs. In all standard diameters and gauges . . . and for all machines.

INSERTED TOOTH INSERTED SECTION

Disston Inserted Tooth or Inserted Section Circular Saws for plastics cutting are fitted with cemented tungsten carbide inserts, which are brazed on surfaces to keep them firmly in position. Shape of teeth and spacing are varied to suit operating conditions and material to be cut. These saws retain their cutting edges longer than other circular saws used for plastics cutting, hence require less frequent sharpening.

DISSTON BAND SAWS

The toughness and high flexibility of these saws enable them to withstand the constant bending and straightening even on small wheel, high speed machines. Supplied in two types for plastics cutting, each made of durable Disston Steel: (1) HARDENED THROUGHOUT

for cutting of hard and abrasive plastics, and for operating at speeds of 2000 to 4000 f.p.m.; and (2) HARD EDGE FLEXIBLE BACK for speeds of 800 to 1000 f.p.m. Two different sets: Straight and Raker. In all standard sizes.

DISSTON

CARBOLOY-FITTED SAWS, CUTTERS and SHAPER KNIVES

Recommended for use in shaping laminated phenol resinoid and other plastics with similar cutting characteristics. Supplied in a number of standard patterns, Disston Carboloy-Form Cutters and Shaper Knives are made to your specifications. Fitted with Carboloy to assure fast, clean cutting and long tool life. Bevels on edge of knives are accurately ground to provide a perfect fit in the collars. Also supplied in solid steel for high speed machines.

DISSTON BITE-RITE FILES

for HAND USE . . . for MACHINE USE

An exclusive product of Disston engineering that combines speed, long life and exceptionally smooth work. Teeth are clean, strong and sharp; cut at correct angles; uniform in width and depth; and staggered for straighter, faster, smoother cutting. Improved heat treatment gives Disston Bite-Rite Files an unusually long life. Supplied in all standard cuts, shapes and sizes . . . for hand or machine use . . . and for all materials.

Order from your Disston Distributor or write direct for further particulars.

STEEL—Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

ESTABLISHED 1840 REG. U.S. PAT. OFF.

HENRY DISSTON & SONS, INC., 1234 Tacony, Philadelphia 35, Pa., U.S.A.

CHEMICAL MAGIC

MEET THE MAGICIAN'S ASSISTANT

Out of such common materials as salt, sand and petroleum, the big new General Electric silicone plant at Waterford will produce unique materials; oils, greases, rubber, plastics and varnish to withstand heat and cold to a degree never before possible; one of the most water repellent films ever known . . .

That is chemical magic. The results and the methods of obtaining them are equally astounding. Now let's look behind the scene. In development of this project General Electric turned to Blaw-Knox for process engineering and process equipment. The magician needed a good assistant, someone he could lean on for real help in working out very special processing techniques. We did our part well. The magician is now using his assistant on other difficult jobs.

Let us help with your processing problems.

CHEMICAL PLANTS DIVISION
OF BLAW-KNOX CONSTRUCTION COMPANY
321 Penn Avenue, Pittsburgh 22, Pa.

BLAW·KNOX

HOW TO SQUARE A CIRCLE

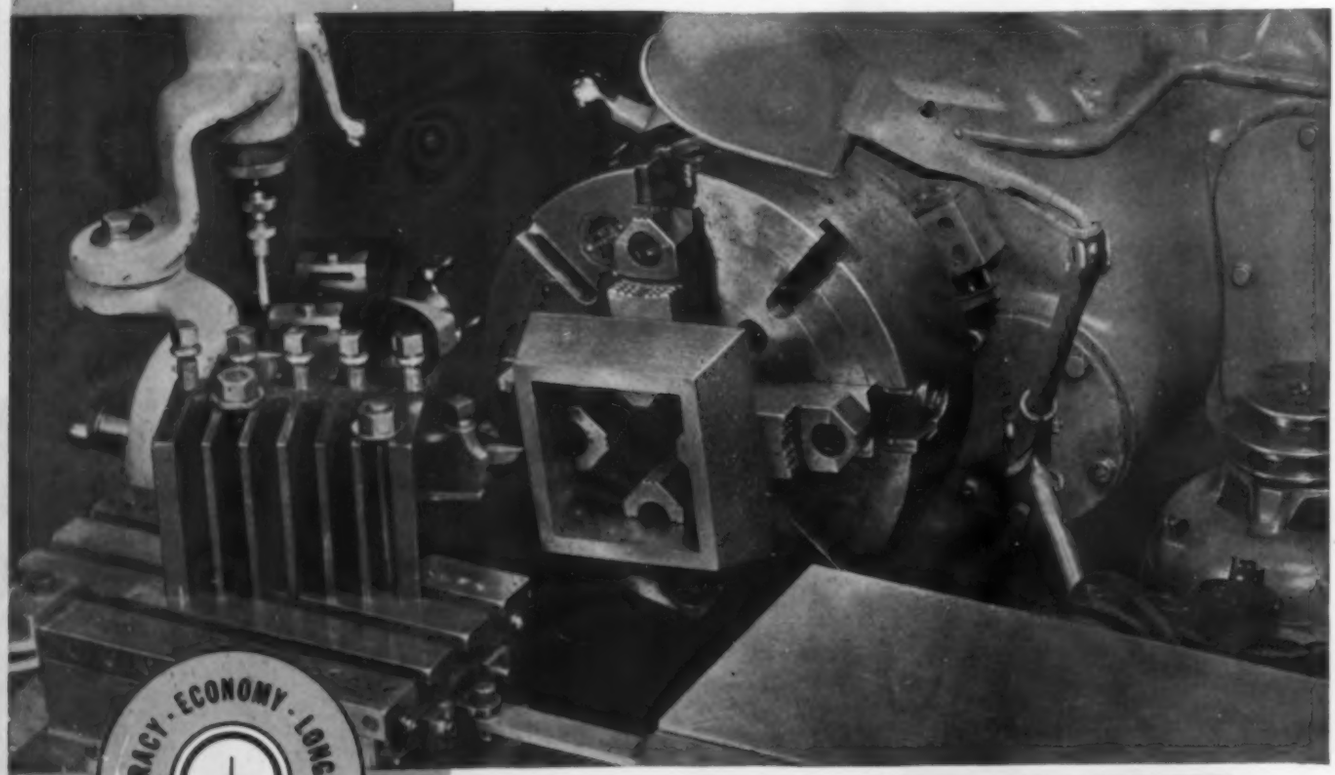
with Monarch's Shapemaster Lathe

That's right—we're actually *turning* a square—on a lathe!

But that's not all—we've bored the square, too, on a taper—and a square is only *one* of an almost infinite variety of shapes we can turn; ovals, stars, triangles, flutes (even up to *500 of 'em*, flat, convex or concave). We can blend from a round to an oval or a hexagon or a square or any other shape. In addition, we can produce sharp, clean-cut corners in recessed or exterior angles. Fact is, we can turn or bore almost any conceivable contour that allows room for a tool point.

You can do it, too. All you need is the famous Monarch Shapemaster Lathe. Think what that means—intricate, costly dies *turned* on a machine, to exacting tolerances—in a fraction of the time required for handwork—and at a fraction of the cost!

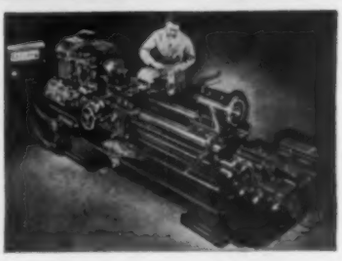
If you're doing die work—or any contour turning in metal—you owe it to yourself to investigate the Shapemaster. Like more facts? We'll be glad to oblige. Just write to The Monarch Machine Tool Company, Sidney, Ohio.



ACCURACY - ECONOMY - LONG LIFE

Monarch TURNING MACHINES

For complete factual and pictorial information on how the famous Monarch Shapemaster can save you time and money in the precision production (or reproduction) of dies, write for your copy of Bulletin 2501.



Here's another

NEW USE FOR

CO-RO-LITE

the versatile rope fibre plastic

ACWARE PLASTICS, in Los Angeles, California, find Co-Ro-Lite ideal for the manufacture of these picnic cases. Attractively made in different colors, the Co-Ro-Lite in this case is furnished in sheets all ready for molding.

CO-RO-LITE is a ready-to-mold, high-impact industrial plastic compound reinforced by long, tough rope fibres that form an interlocking system of remarkable qualities. It is readily preformed and molded into compound curves—deep draws—angles—channels and large shells.

CO-RO-LITE is equally effective with fluid pressure, flash or transfer molds. The long, tough interlocking rope fibres reinforce all sections of the molded unit, imparting great impact, flexural, compressive and tensile strength in a range of densities comparable to wood.

For greater strength, it's CO-RO-LITE, *the rope fibre plastic. Consult our engineering department at any time. There is no charge or obligation, and you'll be amazed how Co-Ro-Lite, the versatile rope fibre plastic, can solve many of your difficult problems.*

ALLIED PRODUCTS DIVISION

COLUMBIAN ROPE COMPANY

460-92 Genesee St., Auburn, "The Cordage City," N. Y.

Canadian Licensee: Canadian Bridge Engineering Company, Ltd., Box 157, Walkerville, Ontario, Canada.

Stray Metal can't pass this electronic watchdog

VICKS COUGH DROPS pass through this RCA metal detector *after* packaging . . . last of a series of controls on product purity.

THIS WHEATENA metal-detector installation is continuously on duty . . . safeguards quality of this popular breakfast food.

STEPHANO BROS., cigarette manufacturers, electronically inspect leaf tobacco . . . report that the metal detector paid for itself the first month.

KAYE-TEX MFG. CO., plastics manufacturers, use the metal detector to inspect plastic sheets . . . protect calender rolls. Speed: 115 feet per minute.

RCA's Automatic Metal Detector provides final check on product purity

TYPICAL of the precautions taken by industry to assure 100 per cent protection to its customers are these installations of RCA's metal detector.

Such equipment helps eliminate the last element of chance from product inspection—is assurance against the possibility, however rare, that a bit of stray metal might accidentally get into your product.

These metal detectors are placed in the regular production line . . . can spot particles as small as 70 thousandths of an inch in diameter at conveyor speeds *up to 600 feet per minute.*

The material passes through the metal detector's aperture. *Any* metal or alloy . . . magnetic or nonmagnetic . . . even if deeply embedded, causes the detector to act instantly.

The action can stop the conveyor . . . sound an alarm . . . reject contaminated packages or bulk goods automatically . . . or mark the material for later removal.

This RCA development provides a final check on conventional visual and mechanical inspection methods. It safeguards product quality . . . preserves customer good will. And . . . if your product passes through valuable processing machinery, you prevent costly repair bills.

Full information on the RCA electronic metal detector is now available. Write Department 55-L.

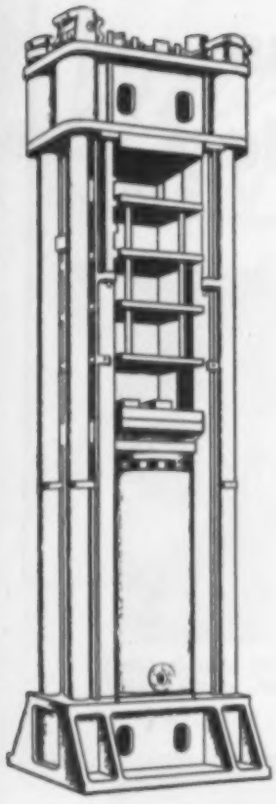
INDUSTRIAL ELECTRONICS

RADIO CORPORATION of AMERICA

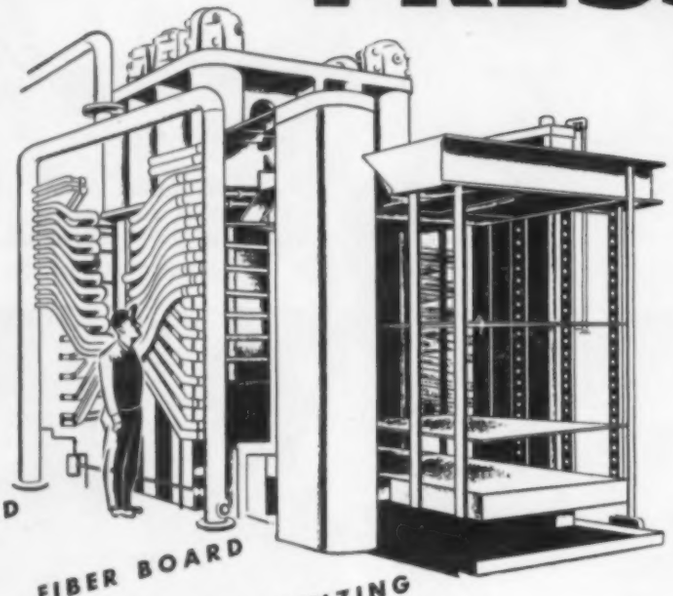
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

Yes, BETHLEHEM CAN BUILD YOUR HYDRAULIC PRESSES



FOR PLASTICS

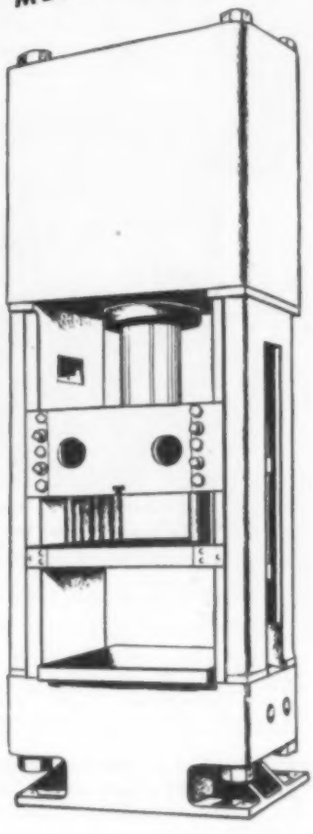


WALLBOARD

FIBER BOARD

VULCANIZING

METAL-FORMING



We suggest that you see us for hot-plate, molding, or metal-working presses. Our shops are equipped to make all three types with details to your specifications.

These machines are built under the supervision of top-flight engineers. As a result, deflection in Bethlehem units is held to an absolute minimum; you are assured of a true, regular advance in a direction perpendicular to the plane of the work.

Bethlehem presses can be furnished with or without self-contained or separate hydraulic power systems. Such items as pumps, accumulators, valves, intensifiers, shock-absorbers and accessories can be included or omitted, according to your specifications.

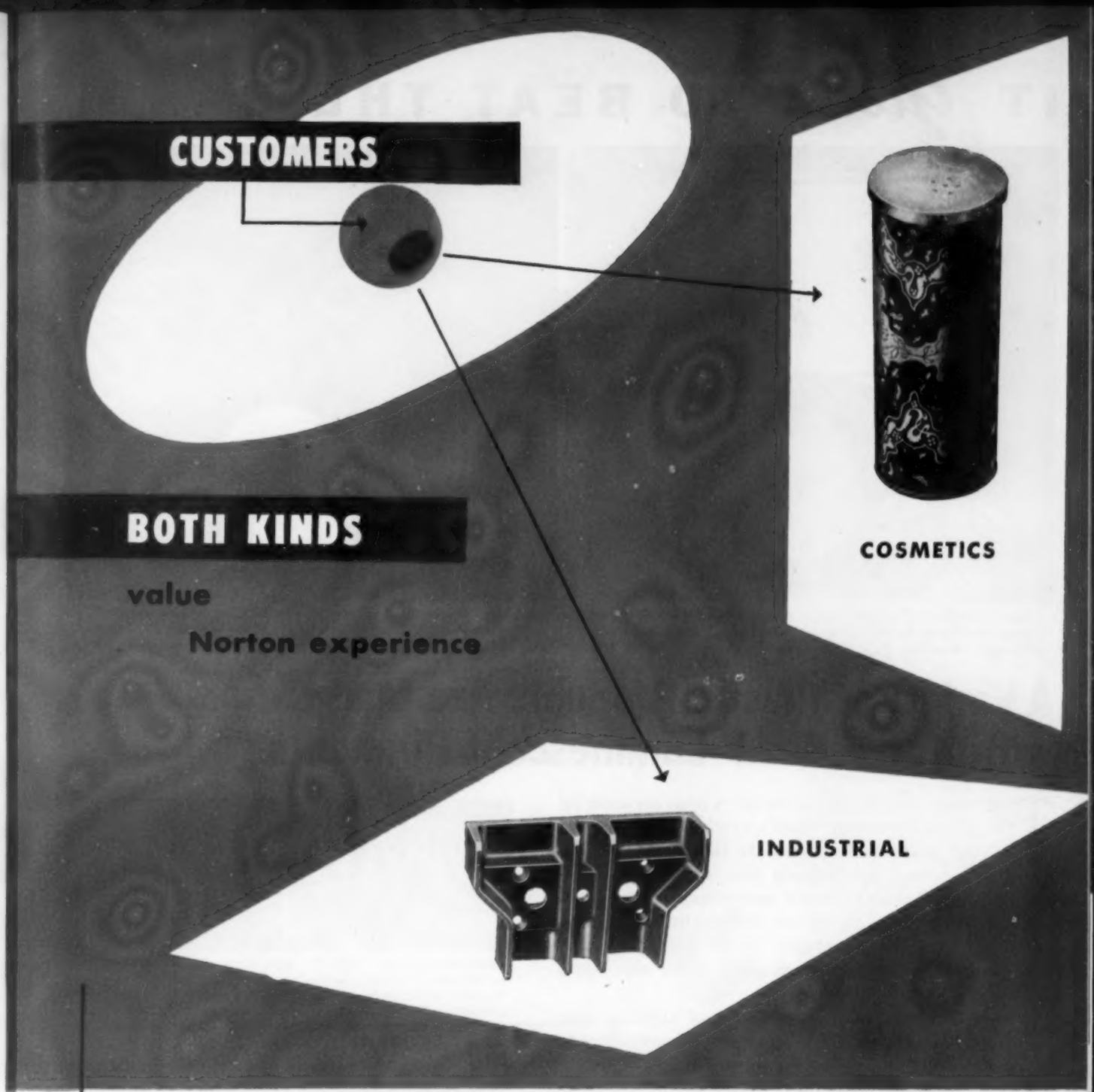
Let our engineers work with you in the planning stage. You will find them well prepared to act as consultants in this specialized field.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation



● When customers ask us whom we do business with, we can do more than mention names they are sure to recognize. We can show them how we've worked with people whose problems are similar to theirs... engineering or packaging problems successfully met with fine moldings.

That's one of the real advantages of having Norton for your molder ...our broad experience.

How will the molding be used? Must it have superior electrical or mechanical properties, or a combination of both? How important is display value...color...style? Shall we mold by compression or extrusion? Experience can provide the right answer in the least time, and our design engineers and technicians have been acquiring this since the industry was an infant.

Two new "right answers" are this complex heavy-duty insulating block for the Safety Car Heating & Lighting Co., and the sifter powder-box top for a famous cosmetics house.

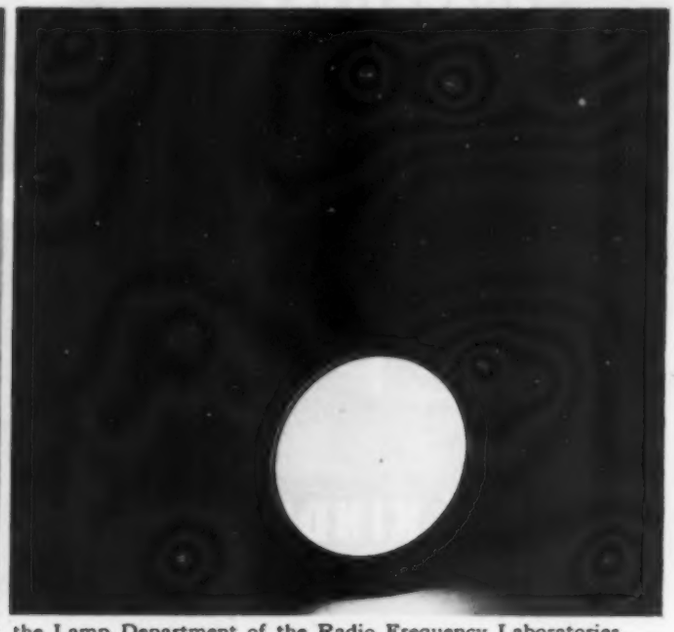
Bring your plastics problems to a molder with a proved record and broad experience...a molder who serves prominent manufacturers in practically every field of industry. We're ready to serve you with skill and with speed. Norton Laboratories, Inc., Lockport, N. Y. *Sales Offices in New York City and Chicago.*

NORTON *Laboratories, Inc.*

SPECIALISTS IN FINE CUSTOM MOLDING

CAPACITY AVAILABLE NOW... *Let us help you move fast in the competitive markets of today and tomorrow.*

IT "Glows" TO BEAT THE BAND!



The "Glo-Drum" plastic lamp, designed and manufactured by the Lamp Department of the Radio Frequency Laboratories, Inc., is all plastic, including the "luminous" drum-head which is phosphorescent Marcolite sheeting (Marco Chemicals, Inc.). It's an attractive light for bedrooms, hallways, game rooms, dens, children's rooms, summer homes, schools and colleges.

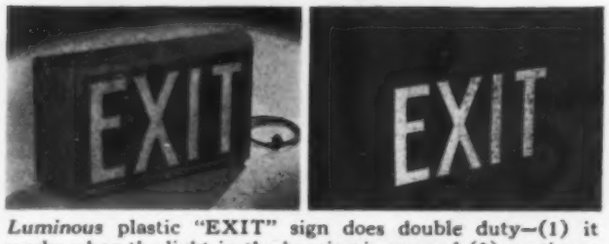
A Variety of Plastic Products Are Made "Luminous" with Horse Head* Luminescent Pigments

THE drum lamp is easy to locate in total darkness by the phosphorescent "bull's eye" emitted by the "luminous" plastic drum-head. It is but one of the hundred-and-one† applications that are appearing in the commercial markets. Other uses include lamp shades, switch plates and plate shield, electric light and door bell switch buttons, flashlights, clock cases and dials, safety signs and markers, push plates, table tops, toys, gifts and novelties.

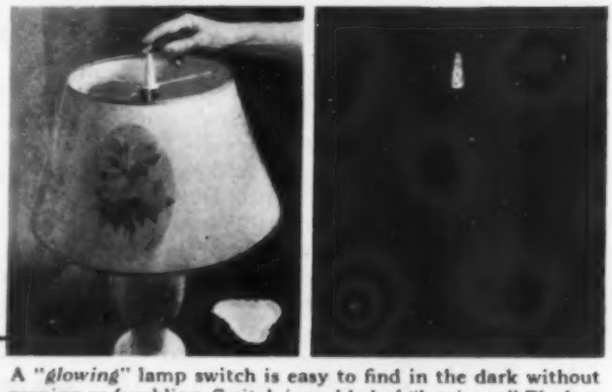
Why not investigate the application of luminous pigments to your products? We welcome the opportunity to work with you, or your customers on any applications you have in mind—and, of course, supply you with more complete information and the names of suppliers of luminescent plastic compounds.

†Send for a copy of our booklet "101 Useful Luminescent Applications."

*Reg. U.S. Pat. Off.



Luminous plastic "EXIT" sign does double duty—(1) it works when the light in the housing is on; and (2) continues to glow in the dark should the light go out. The background around the letters is silk screened in red on "luminous" plastic sheeting (The Homalite Co.) and the panel installed in a metal housing by Nu-Lite Displays.



A "*glowing*" lamp switch is easy to find in the dark without groping or fumbling. Switch is molded of "luminous" Plaskon (Plaskon Division, Libby-Owens-Ford) for the Railley Corporation.

HORSE HEAD PRODUCTS
New Jersey ZINC

THE NEW JERSEY ZINC CO.,
160 Front Street, New York 7, N.Y.

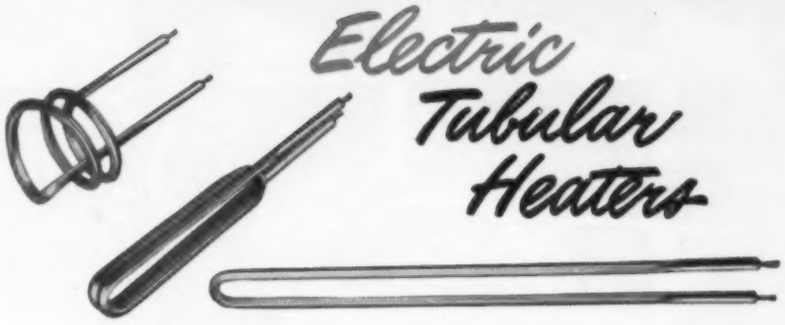
Practically *Anything* that's Plastic CAN BE *Luminous*, TOO!

HEAT

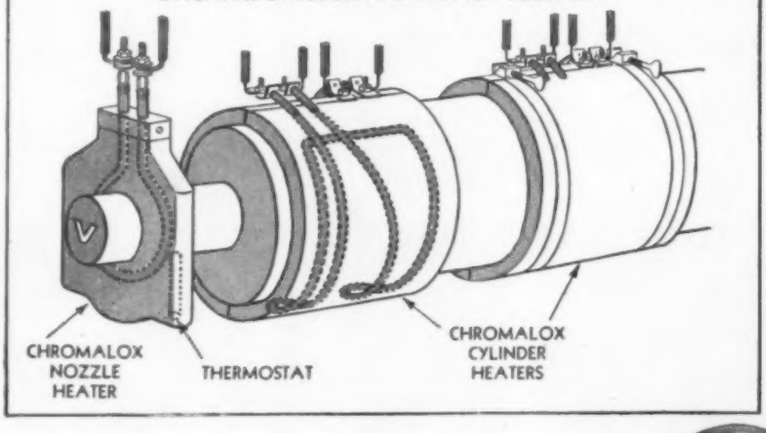
curved to fit your needs!

Chromalox

Electric Tubular Heaters



CHROMALOX ELECTRIC TUBULAR HEATERS CAST INTO ALUMINUM FOR USE IN PLASTICS EXTRUSION AND INJECTION EQUIPMENT



The above is only one example of the many types of applications easily obtained with CHROMALOX *Electric* Tubular Heaters. These heaters can be bent and formed for heating processing equipment, tanks, kettles, dies, platens and irregular surfaces.

Straight Tubular Units are used for convection or radiant heaters in ovens, platens and other high temperature equipment. Accurate temperature controls, with thermostats, guard against excessive processing temperatures.

CHROMALOX Application Engineers will gladly work with you on your heating problems.

Guide to CHROMALOX *Electric Heat* applications

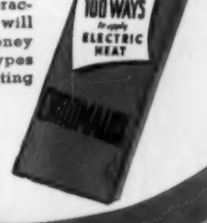
Check this List

- Air Heaters
- Annealing Ovens
- Armature Heaters
- Asphalt Melting
- Babbitt Melting
- Baking Ovens
- Barrel Heaters
- Branding
- Brooders & Hatchers
- Can Soldering
- Cast Heating
- Cleaning Tanks
- Coating Tanks
- Core Baking
- Degreasers
- Dehydrating
- Die Heating
- Distilling
- Dryers
- Dropping Resistors
- Drum Heating
- Drying Ovens
- Duct Heaters
- Electroplating
- Embossing Dies
- Film Dryers
- Foundry Molds
- Fuel Oil Preheating
- Galvanizing
- Gas Heating
- Glue Cookers
- Glue Pots
- Glue Setting
- Hair Dryers
- Heat Sealers
- Hot Plates
- Humidity Control
- Infra Red Heating
- Ink Dryers
- Labeling Adhesives
- Lacquer Dryers
- Lens Cementing
- Matrix Presses
- Melting Pots
- Mold Heating
- Molten Salt Baths
- Oil Baths
- Oven Heaters
- Package Sealers
- Paint Dryers
- Pipe Heating
- Pitch Pots
- Plastic Extruders
- Platen Heaters
- Plating Baths
- Preform Heating
- Print Drying
- Process Air
- Process Kettles
- Radiant Heating
- Roll Heaters
- Room Heaters
- Sealing Equipment
- Soaking Tanks
- Soldering Irons
- Space Heaters
- Steam Generators
- Steam Superheaters
- Sterilizers
- Tempering Baths
- Tinning Pots
- Tire Recapping
- Varnish Drying
- Volatile Fluid Heating
- Vulcanizers
- Water Heaters
- Wax Melting

and Hundreds of other Applications throughout Industry

GET THIS BOOKLET

It is loaded with practical ideas which will save you time, money and labor in all types of industrial heating applications.



CHROMALOX

Electric Heat at its Best

EDWIN L. WIEGAND COMPANY • 7503 THOMAS BLVD. • PITTSBURGH, PA.

IC-35

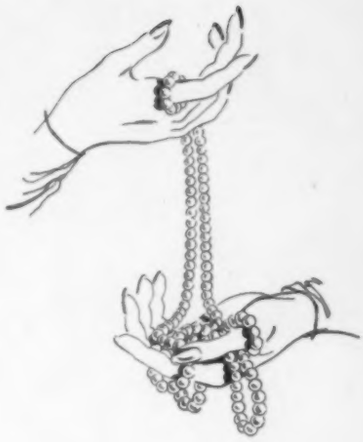
Get Standardized Performance with this more uniform Duck

You get uniform permeability in your laminates when you use MT. VERNON Extra fabrics because of their *more uniform* weave. This uniformity in MT. VERNON fabrics . . . the result of rigid laboratory controls during their weaving . . . assures you stable laminates through every run. For a laminate duck that has standardized uniformity, specify MT. VERNON Extra duck.

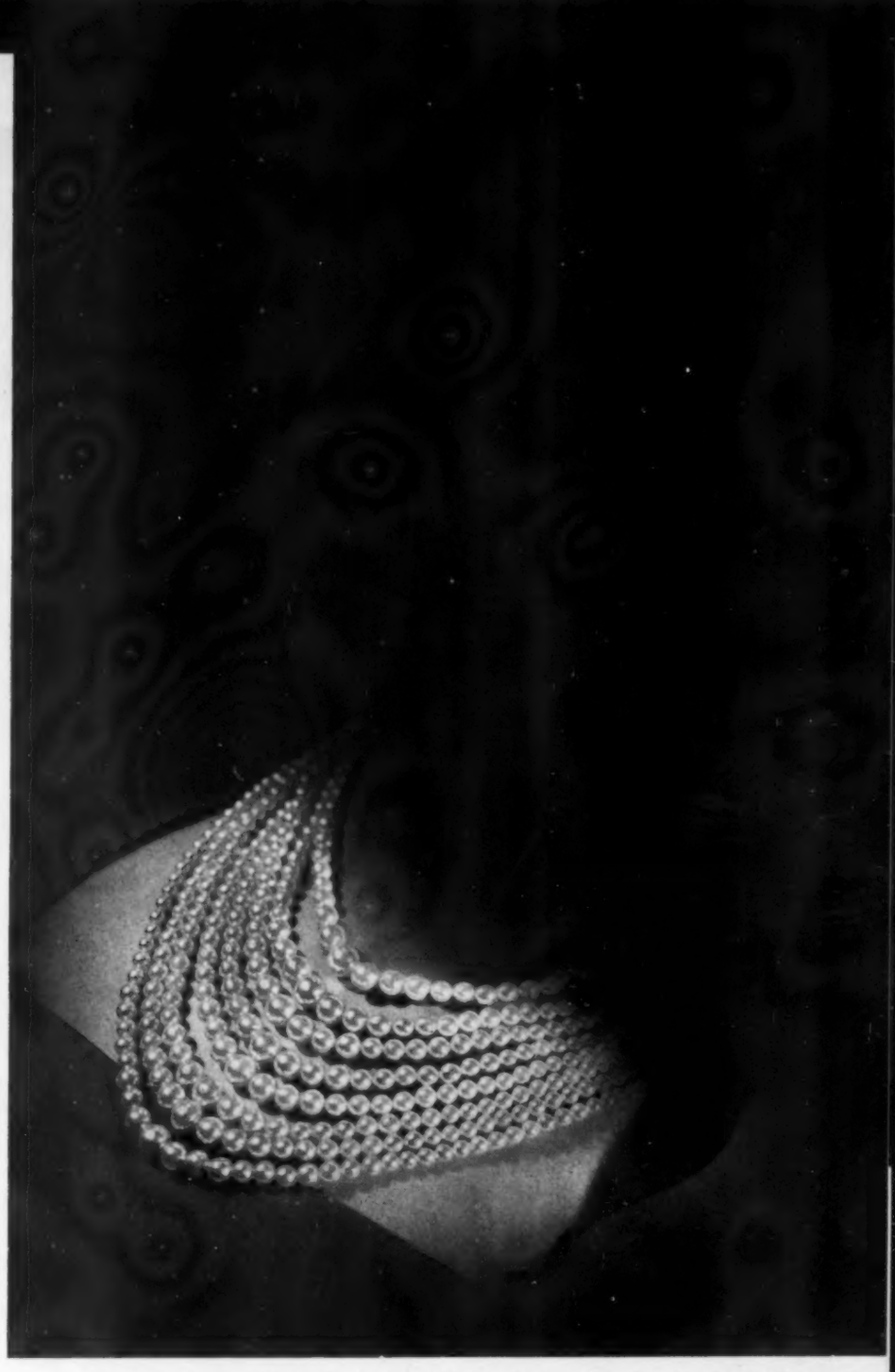
Mt. Vernon-Woodberry Mills

TURNER HALSEY
COMPANY
Selling Agents
40 WORTH ST. • NEW YORK

Branch Offices: CHICAGO • ATLANTA • BALTIMORE • BOSTON • LOS ANGELES • AKRON



FOR *The Look of Culture*



Extruded by Keystone Plastics Co. for Orange Machine Products Co. Coated by Spencer Novelty Co.

Again Chemaco adds the *custom-made look* to a mass produced article . . . this time in exquisitely lovely plastic pearls that duplicate nature's masterpieces in every important respect—size, weight, warmth to the touch and lustre. To produce these modern classics, extruded rods of milky white, unbreakable Chemaco Cellulose Acetate, already pierced, are cut into short lengths and put through centerless grinders. For the final touch of beauty, the beads are dipped in a special lustrous coating.

Chemaco Cellulose Acetate and other Chemaco plastic molding powders stand ready to help you obtain the custom-made look for *your* mass production articles. Our new Ethyl Cellulose formulations achieve an amazing sleekness of finish that makes any product look more expensive. And Chemaco's lubricated and modified Polystyrene makes for easier and faster molding of this popular material. The range of color is limitless, and the cost remarkably low. All rejects, gates and sprues may be reground and remolded, thus eliminating all waste.

For that custom-made look in *your* products, consult Chemaco. Write today to Chemaco Corporation, Berkeley Heights, N. J. Branch office in Cleveland, Ohio.

Chemaco

CHEMACO ACETATE MOLDING POWDERS • **A KOPPERS PRODUCT**

Also Manufacturers of Ethyl Cellulose and Polystyrene

"This advertising message, appearing in 4-color cover position in NEWSWEEK, BUSINESS WEEK and U. S. NEWS, is developing business for Monsanto Lustron molders and fabricators."

how to dramatize a sale

Hole Cutter Box—Molded by The Houston Corporation, West Los Angeles, California.

Boring Bar Box—Molded by South Gate Tool Engineering Co., South Gate, California.

Auger Bit Box—Molded by aaRBee Plastic Company, Los Angeles, California.

another LUSTRON success story

A MONSANTO PLASTIC

You can use Lustron to *make products . . .* or to *make them sell,* too!

Today, many alert merchandising manufacturers put Lustron to selling via beautiful, appealing packages for their products . . . for premiums, for displays, for package components, and accessory or optional attachment kits.

You see here, three typical outstanding selling jobs by Lustron in the industrial field. Instead of tying a muslin bag full of accessories on to the order . . . or putting tools into a dull looking box . . . these smart manufacturers present them in cleverly designed, fitted boxes molded of Lustron.

The small extra costs of these attractive kits are more than paid for by the lasting satisfaction and impression of good value the buyer receives.

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

1	Rainbow choice of colors . . . clear to opaque
2	Lustrous finishes
3	Light weight
4	Low cost
5	High dimensional stability
6	Resistance to acids, alkalies, water
7	Freedom from taste or odor
8	Adaptability to fastest mass production

If you would like to know more about how Lustron can serve you as a star salesman, address: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. In Canada, Monsanto (Canada) Limited, Montreal.

Lustron: Reg. U. S. Pat. Off.

Assembly Costs Slashed 25%

64 SPEED NUTS on each "Electro" Cigarette Vending Machine *Boost* Production and *Reduce* Assembly Costs.

Push-on type SPEED NUTS are used over die cast studs as shown at left, to attach medallion and delivery compartment bezel, and for other fastening jobs not visible in photo. C7000 flat type SPEED NUTS are used to attach hinges to top cover, bottom frame and doors.

Mr. M. Caruso, President of C-Eight Laboratories, Newark, New Jersey, has this to say about SPEED NUTS:

"Further experiments increased the use of SPEED NUTS in assembling our "Electro" All-Electrical Cigarette Vending Machine. Since this change over, a study of our costs reveals a *saving up to 25%*. We feel sure that more and more Tinnerman fasteners will be used on our equipment and will set a standard of quality and perfection for the ultimate user."

We're sure we can help you produce a better product at lower cost. Write us about your assembly problem today.

TINNERMAN PRODUCTS, INC. • 2048 Fulton Road, Cleveland 13, Ohio

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessaires Simmonds, S.A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Speed Nuts* PATENTED Trade Mark Reg. U. S. Pat. Off.

MORE THAN 4000 SHAPES AND SIZES

FASTEST THING IN FASTENINGS

Reverence...in Plastics

Holy Water Fount
Molded for
Bristol-York Associates
Chicago

In molding this holy water fount, we humbly endeavored to express in it a feeling of simple beauty—dignity—reverence. This embodiment of moods in plastic materials is further evidence of our "imagineering"* ability...an ability we feel sure can satisfy your most exacting demands in injection molding artistry and extrusion craftsmanship.

We apply equally painstaking care and skill to all types of molding assignments from the simple to the highly complex and in the desired mood, whatever it might be. Let us mold your product in the right mood for its most profitable use. We invite your inquiries without obligation.

*Imagination plus engineering skill

Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about [redacted]* pipe, tubing and fittings, write for circulars containing data and illustrations.

*Trademark Reg.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Lustron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

153 WEST HURON STREET • CHICAGO 10, ILLINOIS

Sturtevant Blenders handle all intake and discharge through one opening. Simple, single lever opens and closes gate. Illustration at left shows machine receiving . . . right discharging.

4-WAY MIXING ACTION

Assures Uniform, Perfectly Blended Batches with Sturtevant *Rotary Batch Blenders*

Because Sturtevant Rotary Blenders use a 4-way mixing action, they provide a *thoroughly blended product* no matter what the ingredients . . . densities . . . weights . . . finenesses . . . or other physical properties of the materials to be blended.

Here's how they operate—as materials are poured into the receiving hopper, they are picked up by the revolving buckets, and carried to the top of the blending chamber where they are cascaded and intimately mixed. At the same time the drum revolves forcing the materials from both ends toward the center of the drum . . . while the swinging chute, which is in the blending position produces an important lateral fourth mixing action. The result, a perfect blend with *no* substances floating to remain unmixed.

Investigate Sturtevant Rotary Batch Blenders. They are available in many sizes with capacities from 1000 to 7500 lbs. Write for details and specifications.

STURTEVANT
MILL COMPANY
110 Clayton Street, Boston 22, Mass.
Designers and Manufacturers of
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

For ITACONIC ACID

$$CH_2 = C(COOH)-CH_2-COOH$$

Molecular Weight	130.10
Appearance	White, crystalline, solid
Melting Point	167-168°C.
Solubility in Water	At 20°C. a saturated solution contains 7.6 grams of Itaconic Acid per 100 grams of solution.

• Research chemists in industry are finding that Pfizer Itaconic Acid can be used as a raw material in a variety of ways. This unsaturated dibasic acid is available for experimental use.

Here are some of its uses and potential uses:

- as a raw material in the preparation of resins of several types
- its esters can be polymerized or co-polymerized with other monomers to form resins of widely varying properties
- to produce citraconic or mesaconic acid
- on reduction it forms methyl succinic acid

Its structure suggests that it might prove a useful raw material for wetting agents.

Samples and further information may be obtained from Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Avenue, Chicago 10, Illinois; 605 Third Street, San Francisco 7, Calif.

Turn First to **PFIZER**

Manufacturing Chemists Since 1849

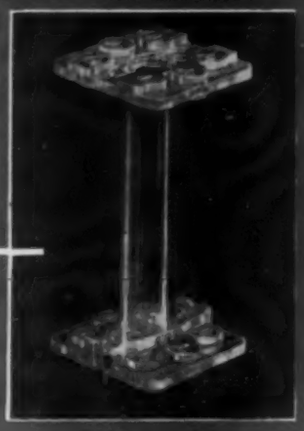
5284

ERIE RESISTOR

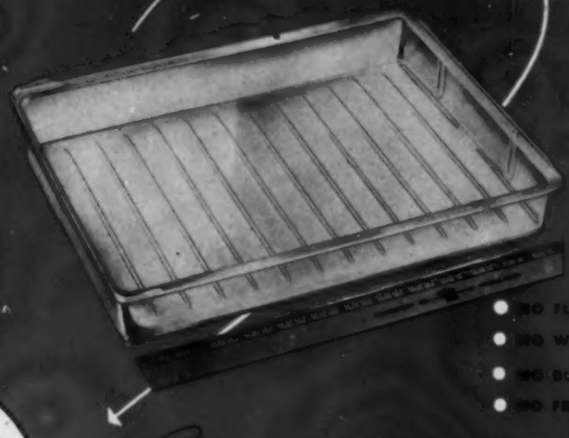
Custom Molded Plastics

How *Precise* is Precision?

ERIE RESISTOR
CUSTOM MOLDED
Plastics
REVISE PREVIOUS
CONCEPTS



It's another . . .
ERIE RESISTOR
CUSTOM MOLDED JOB



- NO FLOW LINES
- NO WARPING
- NO BUBBLES
- NO FROSTING

THIS *Big* POLYSTYRENE REFRIGERATOR DRIP TRAY

ER
A SYMBOL OF QUALITY

Better Dies Mean Better Molded Parts

that's why
ERIE RESISTOR
has its own
Die Department

The illustrations give only a hint of the versatile facilities of Erie Resistor for the production of custom molded plastics. A large part of that versatility lies in the ingenuity of an experienced engineering staff which is kept constantly on its toes by getting assignments that have been pronounced "impossible" by less experienced or less skillful operators. In fact such experiences have been so frequent that it has become a byword in the trade that "You don't know it can't be done until you have tried Erie Resistor."

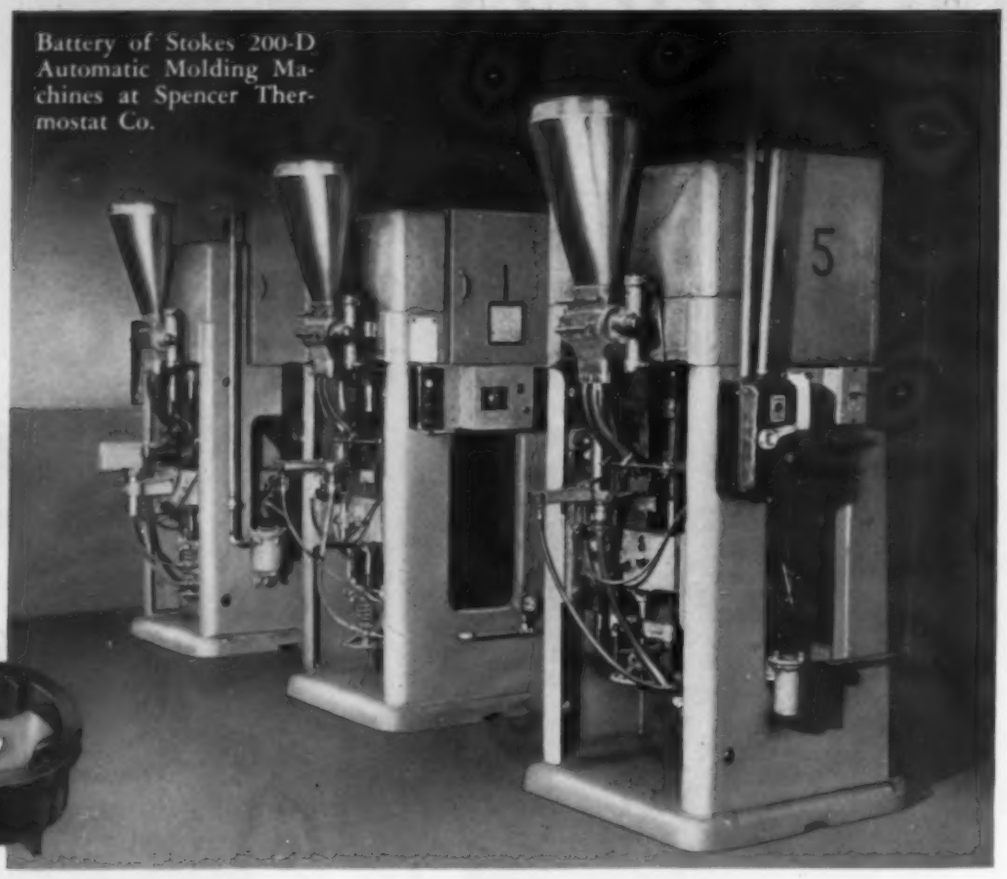
That extra skill may be in molds properly designed by Erie Resistor engineering department. It may be in the precise construction and expert maintenance of molds in our own die shop. It may be in selection of the right plastic for the job, or in accurate control of heat, timing and pressure. Often it's a combination of all these factors that brings the enthusiastic comment, "Erie Resistor has done it again!"

For a practical solution of your custom molded plastics problems come to Erie Resistor.

Plastics Division

ERIE RESISTOR CORP., ERIE, PA.

LONDON, ENGLAND • • TORONTO, CANADA



Battery of Stokes 200-D Automatic Molding Machines at Spencer Thermostat Co.

KLIXON
Motor Protector and Motor Starting Relay—both formed on Stokes Presses.

SPENCER THERMOSTAT CO. HAS

4 Big Advantages

WITH *AUTOMATIC MOLDING*

Like many other molders of plastic parts, Spencer Thermostat Company of Attleboro, Mass., finds *completely automatic molding on Stokes presses* the best answer to their problem.

At Spencer, famous "KLIXON" Motor Protectors and Motor Starting Relays are formed on Stokes machines . . . with these advantages:

1. LOW LABOR COST . . . because with Automatic Molding one semi-skilled operator can tend a battery of presses.

2. LOW MOLD COST . . . because a few cavities do the work of many. Molds are quickly made, quickly put into production.

3. HIGHEST QUALITY PARTS . . . because they are produced under identical conditions of time, heat and pressure. Few rejects . . . no assembly difficulties.

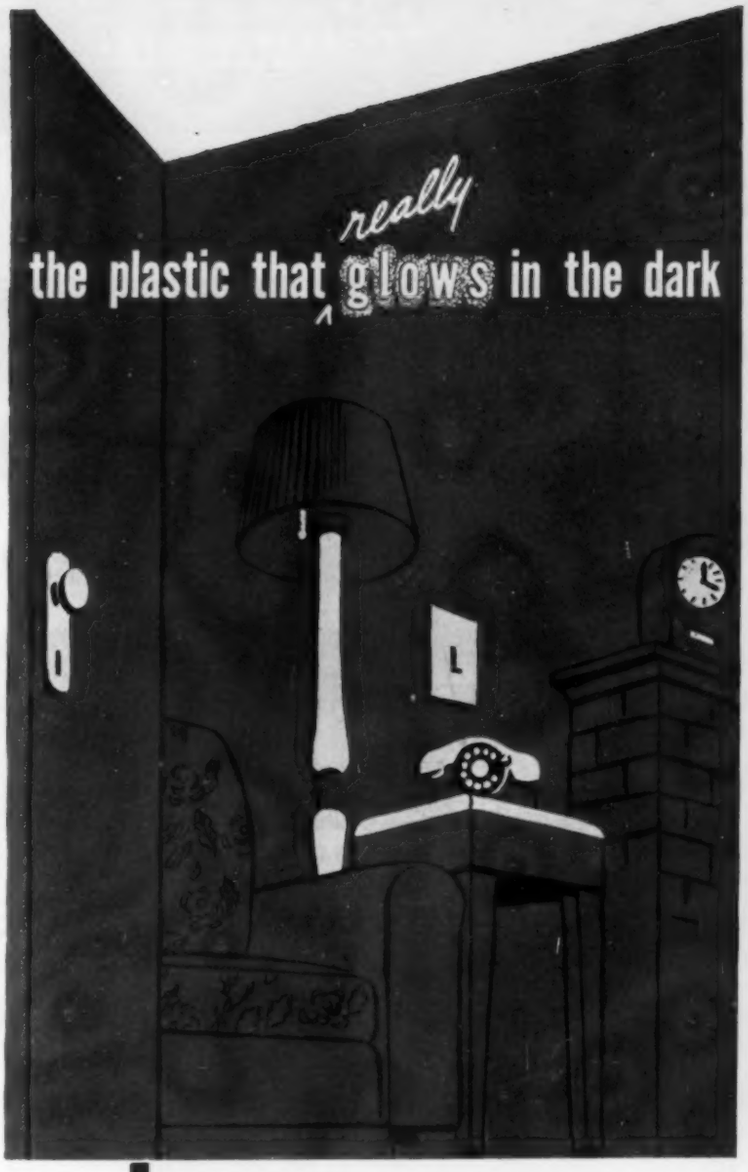
4. HIGH OUTPUT . . . LOW INVENTORY because parts are produced as needed, up to 10,000 or more per week per cavity.

Let us demonstrate the advantages of automatic molding on your product. Send samples or sketches, and state production requirements for cost estimates and recommendations.

F. J. STOKES MACHINE CO.
5934 Tabor Road, Philadelphia 20, Pa.

F.J.Stokes MOLDING EQUIPMENT FJS EST. 1895

. . . and now PAULITE



PAULITE is the amazing new injection molding compound that glows brilliantly in the dark. Produced by a special new method from an exclusive formula, PAULITE provides *maximum initial glow* after activation by light, and a *bright blue afterglow which persists 10 or more hours in absolute darkness!*

It's easy to use

PAULITE requires no additional mechanical working prior to molding—its ¼" or ⅛" pellets are ready for immediate use. Furthermore, PAULITE needs no special treatment during the molding process; it can be handled like any other molding compound. Best of all, you can get PAULITE in special formulations possessing the specific physical properties you need for the item to be molded.

Many profitable applications

Uses for this important new plastic material are as broad as merchandising ingenuity. Lighting fixtures, lamps, flashlights, indicators, dials, theatre fixtures, appliances, household utensils, dashboard accessories, signs and markers . . . these merely suggest the variety of applications and the scope of the market.

THE PREMIERE IN LUMINESCENT PLASTICS
PAULITE
REG. U.S. PAT. OFF.

New colors coming

As a result of newly completed research, in addition to blue, you will shortly be able to get PAULITE in such brilliant and beautiful luminescent colors as yellow, green, orange and violet.

Luminescent
PLASTIC CORPORATION
201 N. WELLS STREET CHICAGO 1, ILL

MAIL THIS COUPON FOR FULL DETAILS

LUMINESCENT PLASTICS CORP.
201 N. Wells Street
Chicago 1, Ill.

Gentlemen:

We're interested in PAULITE, the plastic that really glows in the dark, for molding the following items.....

.....

Please send us detailed information on PAULITE'S physical properties and colors. Include data on prices and delivery dates.

Name.....

Firm.....

Address.....

KALAMAZOO
KALAMAZOO STOVE & FURNACE CO.

NORGE
NORGE DIV., BORG-WARNER CORP.

SEARS ROEBUCK & CO.
KENMORE APPLIANCES

LEADING APPLIANCE MANUFACTURERS

Let GRIGOLEIT Handle It

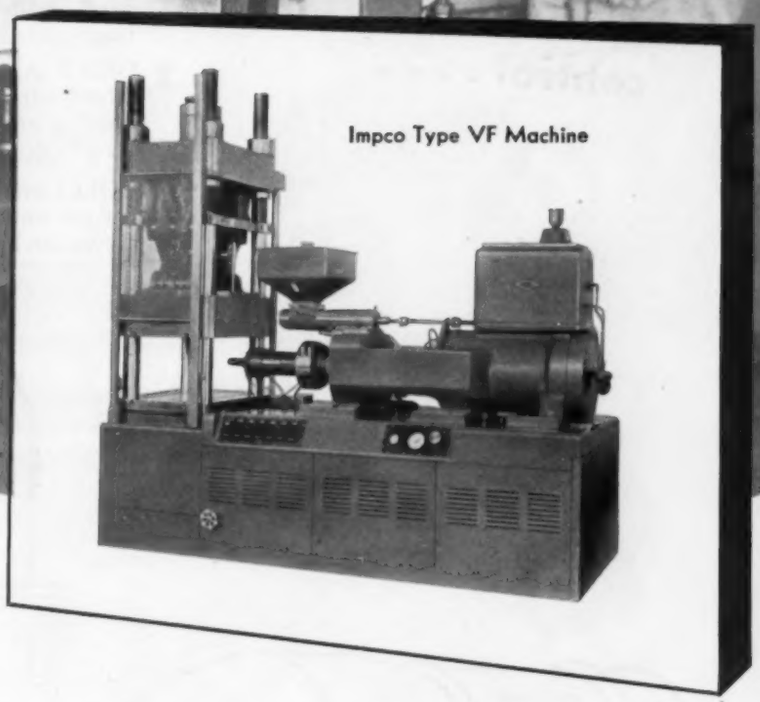
Leaders in the appliance industry rely on Grigoleit handles. Kalamazoo Stove & Furnace Co. use Grigoleit handles on their modern gas and electric ranges. The Norge Div. of Borg-Warner Corporation and Sears Roebuck & Co., specify Grigoleit, too, for smartly-styled gas range handles.

The leaders use Grigoleit handles—and there's a reason! Grigoleit handles are manufactured by a pioneer plastic molder. Over 20 years experience in molded plastics; skilled engineers and designers; modern, complete facilities for metal working, compression, transfer and injection molding are your assurance of superior plastic trim designed specifically for your product.
For the solution to your plastic's problem—LET GRIGOLEIT HANDLE IT.

A colorful, fact-packed 28-page catalog illustrating **stock** handles, pulls, knobs, pendants and closures available on request. Write Dept. M-12.

THE GRIGOLEIT COMPANY
"Twenty Years in Plastics"
744 E. NORTH ST. DECATUR, ILLINOIS

the birth of a NEW IDEA IN MOLDING



Impco Type VF Machine

THIS is the laboratory machine on which the operating principles of the Impco VF type machine were worked out. It looks pretty crude but from it came one of the really significant molding techniques . . . injection-compression molding.

Modern, streamlined Impco VF's now operate in numerous plants . . . doing things no other machines can do . . . earning more money for their owners by giving them a definite edge over competitors.

Impco's creative approach is also demonstrated in machines for plunger or transfer molding and for injection molding. Why not look into the possibilities of these machines and see what they may mean in relation to your problems?

MP-10

PLASTIC MOLDING MACHINERY DIVISION

Improved **PAPER MACHINERY CORPORATION**

NASHUA · NEW HAMPSHIRE

announcing:

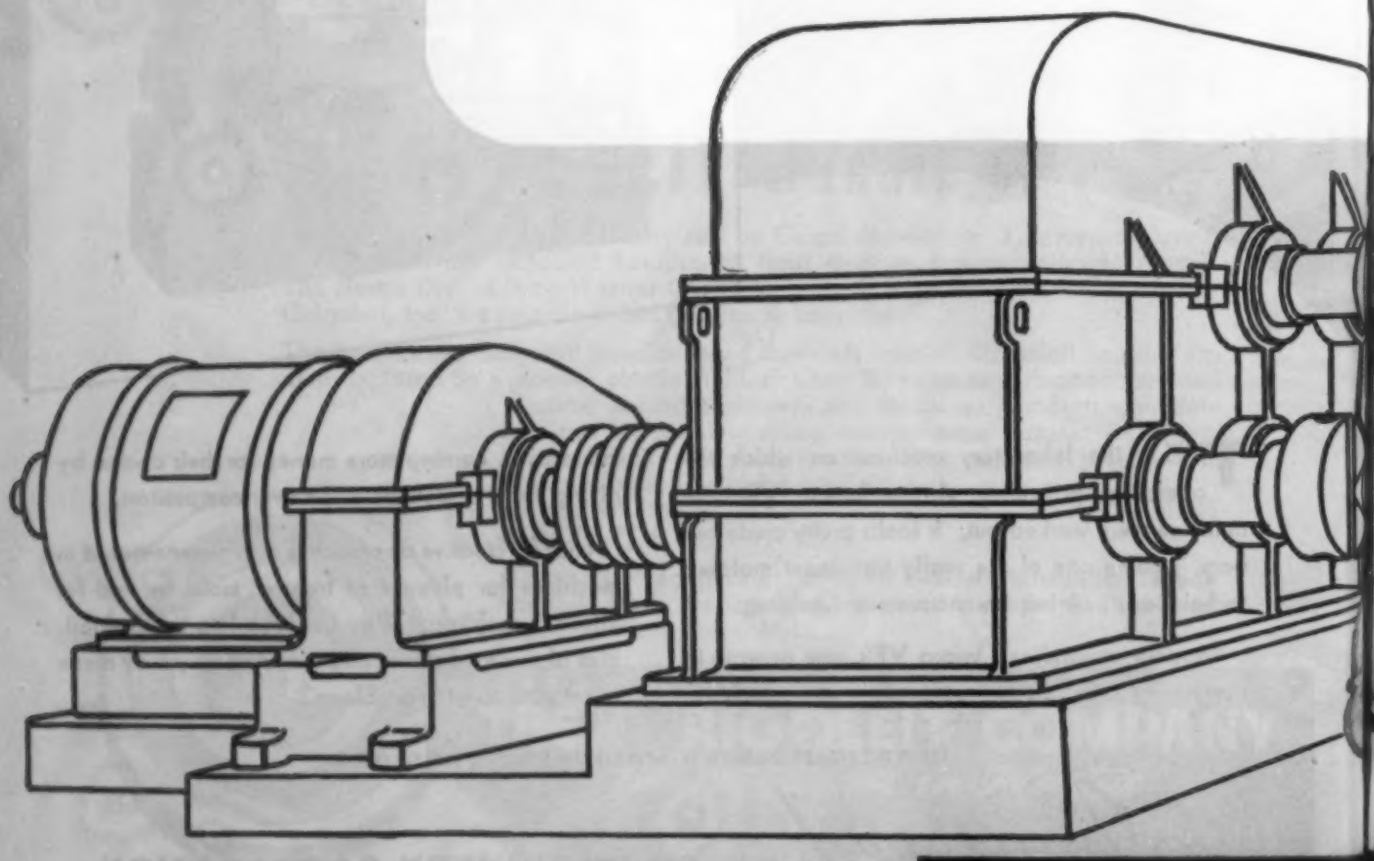
THE NEW FARREL-BIRMINGHAM Z

Engineered to enhance accuracy, uniformity, quality and operating control . . . .

This *first* Z-type, four-roll calender represents the most significant advance in calender design since Farrel-Birmingham first built calenders for the rubber industry in 1854.

Here is a brief summary of its outstanding features:

1. THE "Z" ARRANGEMENT OF THE ROLLS offers a number of advantages in the production of film to accurate, uniform gauge.
2. HYDRAULIC PRELOADING DEVICES anchor the rolls in their fixed, loaded positions, in bearings of the improved, precision sleeve type.
3. DRIVE AND CONNECTING GEARS are eliminated from the calender itself. The gears are enclosed in a separate fabricated steel housing and are coupled to the rolls with smooth-operating universal spindles.
4. ROLLS are chamber-bored and drilled under the working surface for the most effective temperature control. Means for varying the crown can be built in if desired.



Farrel-Bi

TYPE FILM CALENDER

5 ROLL JOURNALS are flood-lubricated and have improved oil seals to safeguard against oil leakage.

This is another example of the type of engineering that has made Farrel-Birmingham the leader in producing processing equipment for the rubber and plastics industries.

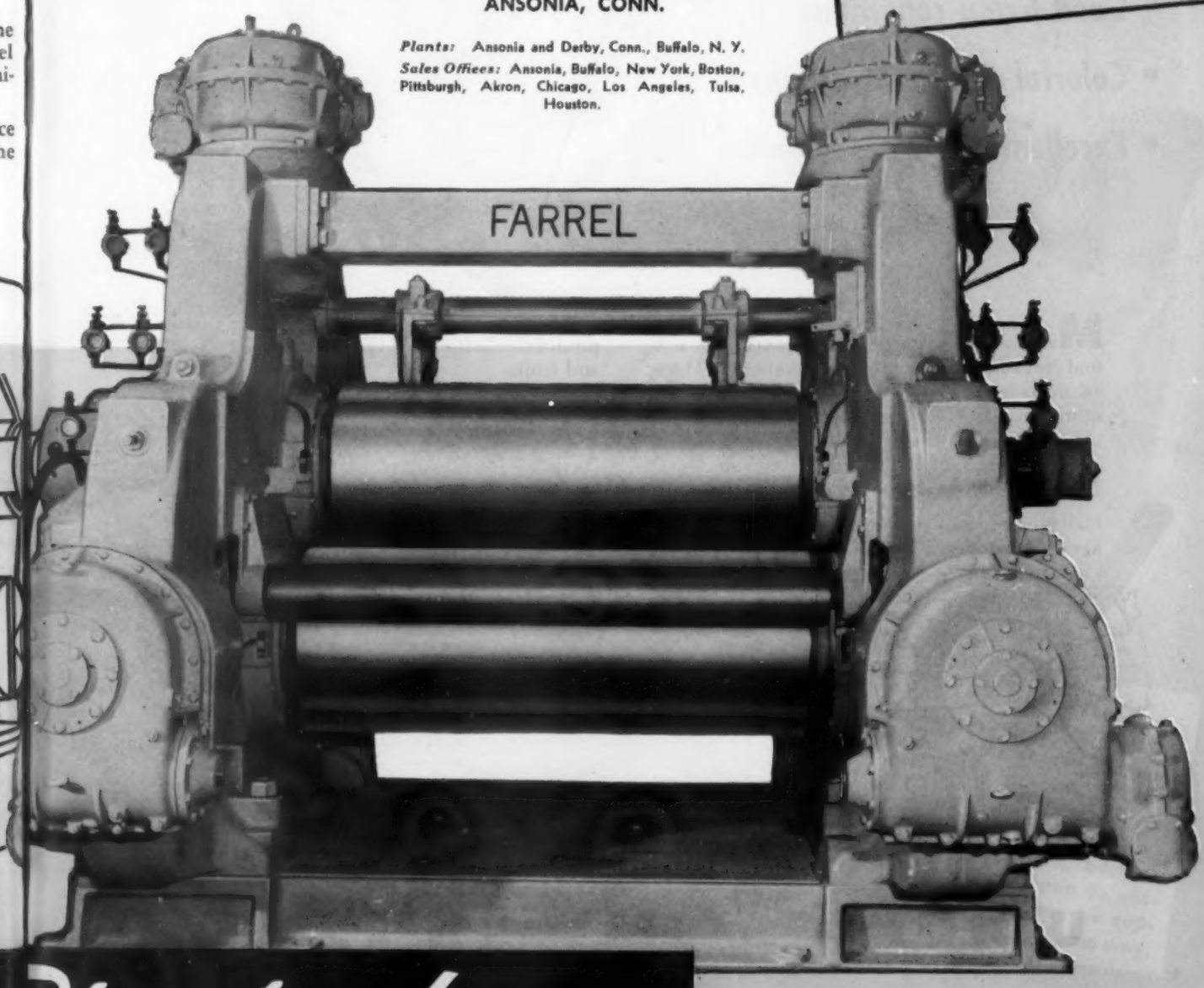
FB-369

Arrangement of rolls in the new Farrel - Birmingham Z-type film calender

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston.

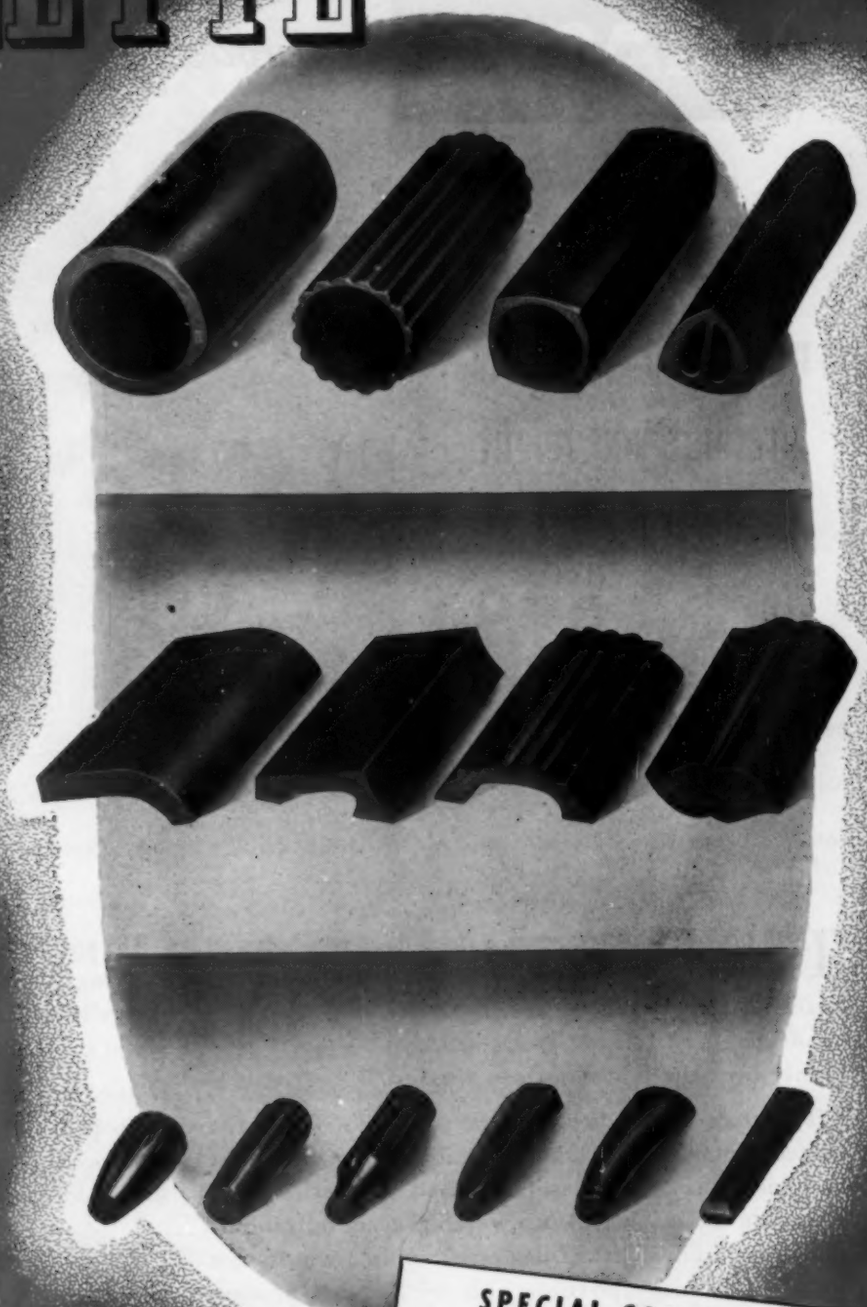


eBirmingham

PATENTS APPLIED FOR

A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

MARBLETTE



Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

MARBLETTE will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

THE MARBLETTE CORPORATION

Manufacturers of Phenolic Resins since 1929

37-21 THIRTIETH ST., LONG ISLAND CITY 1, N. Y.

SINUS MASK

made possible by American Anode's Process and Latex

Does it suggest a new—and profitable—product you might make from latex?

THE problem: To produce a mask that was soft and flexible to conform to the contours of the face and head—that was light yet tough and strong—that was unaffected by heat and water—that applied the heat evenly over the entire surface affected.

The answer: A face-fitting sinus mask in which the heated water is distributed evenly despite irregular contours. The unique design is based on a series of reinforcing interior partitions which prevent bulging or collapsing. This mask is just one item in a whole new related line made possible only by Anode's process and materials.

Results: relief for sufferers and a new and profitable merchandising opportunity for the seller.

Do you have an idea for a new product—or for improving an old one? American Anode development men will welcome the opportunity to consult with you about the possibilities in latex.

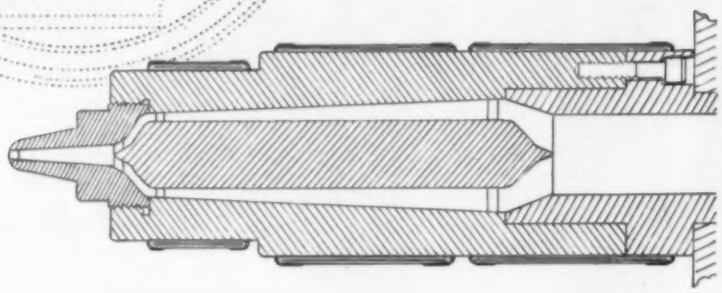
Rubber toys—industrial adhesives—surgical catheters—paper impregnants—meteorological balloons—metal coatings. These few uses show the broad range of possibilities for American Anode latices and mixes.

Latices and compounded mixes of GEON, HYCAR, Saran, neoprene, crude rubber and GR-S are available. For more information about these modern materials —*and proper methods of using them*—please write Department AF-6, American Anode, Inc., 60 Cherry Street, Akron, Ohio.

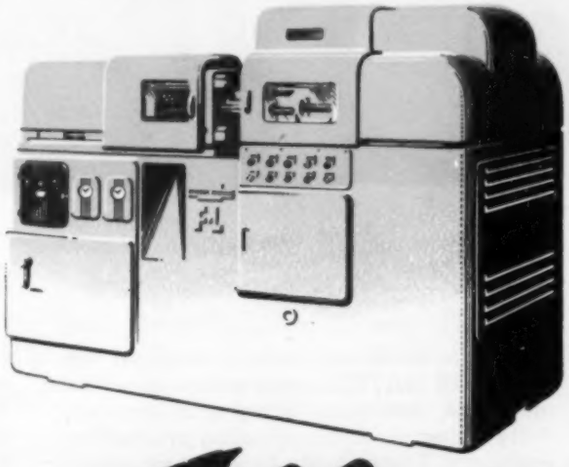
AMERICAN ANODE
INCORPORATED

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS

15% HEAT WATTAGE SAVED



FELLOWS-LEOMINSTER "Speed-Flo" MOLDING sets a new standard of economy in electrical power cost. Not only that, but it also steps up the output rate by anywhere from 124 to 175 additional "shots" per 8 hour shift. All this proceeds from a new balancing of the heat demand, with an exclusive taper-bore cylinder and unique "Taper-Tite" Separator... Every molder will want to know all about the economy of "Speed-Flo" molding. There's a new, fully illustrated circular to be had for the asking. Write: The Fellows Gear Shaper Company, Plastics Machine Division, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Building, Detroit 2; 640 West Town Office Building, Chicago 12; 7706 Empire State Bldg., New York 1. New England Distributor: Leominster Tool Company, Leominster, Mass.



Fellows

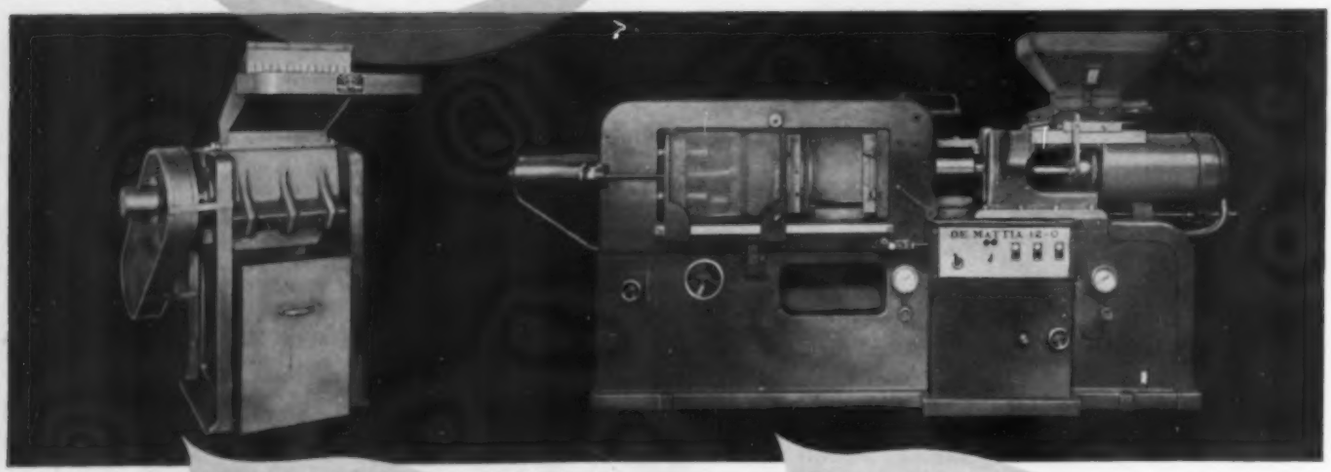
LEOMINSTER

injection molding equipment

DE MATTIA
MOLDING EQUIPMENT

OK

Accepted as Standard in Molding Plants Everywhere!



DE MATTIA SCRAP GRINDERS—Simple to use—feature fast, easy cleaning and full safety construction.

DE MATTIA INJECTION MACHINE—Made in both vertical and horizontal styles—capacities 4 to 32 oz.

In plastic molding plants throughout the world, DE MATTIA equipment—injection machines, molds and scrap grinders—are daily doing their job of aiding production economy. Their ability to stand up under gruelling production schedules, and turn out uniformly good work, helps keep costs in line and places finished products on a sound competitive basis. A reputation for top performance—together with the fact that DE MATTIA design keeps abreast of changing industry needs—is the reason this equipment is universally accepted as standard by molders. DE MATTIA molds—precision built by experienced tool makers—are designed to give the best production at the lowest cost.

Complete data and specifications on all DE MATTIA equipment is available on request. If your injection molding problem is unusual or particularly difficult, our experience and facilities are at your disposal. Your inquiries will receive prompt attention; write today.

DE MATTIA MACHINE and TOOL CO.

CLIFTON, NEW JERSEY • N. Y. Sales Office: 50 Church St. • Cable Address: Bromach, N. Y.

...all are Success Stories for INTERLAKE *Resineering*

Here are three typical examples of resin-treated products that have benefited by Interlake ***Resineering***—the functional engineering of a resin for the specific job requirements. In every case, Interlake ***Resineering*** helps insure a product of top quality, made without production problems and using a resin that costs no more.

Basically Interlake Resineering consists of:

1. **ANALYSIS** of your resin problem followed by our recommendation.
2. **DEVELOPMENT** of a resin suited to your particular application.
3. **JOB TESTING** this resin, in *your* plant, working with *your* men.
4. **STABILIZED PRODUCTION** of the resin for uniformity in performance.

Avail yourself of this complete service by writing The Interlake Chemical Corporation, Union Commerce Bldg., Cleveland 14, Ohio.

Basic Applications of Interlake Resins Include . . .

BONDING—wood, veneer, corestock, cellulose waste and fibrous materials.

SURFACING—wood, paper and fabric.

LAMINATING—fabric, paper and wood.

IMPREGNATING—wood, plaster and other cellular materials.

INTERLAKE CHEMICAL
Corporation
• PRODUCTS FROM COAL •

TAKES TIME OUT — PUTS STRENGTH IN

...and solves a tricky problem

The internal wiring system of Time-Rite is secured with two P-K Type "F" Screws. Screw near center is positioned one-half turn from the bottom to permit movement of springs when changing bulbs.

No inserts or tapping needed to secure this scale friction clip. A P-K Type "F" Screw is simply driven into a plain hole.

AN ESTIMATED 50% saving over the cost of tapping for machine screws is credited to the use of P-K* Screws in assembly of this precision timing instrument for aircraft engines. In addition, Gabb Manufacturing Company secured greater strength and solved a tricky fastening problem. The design of Time-Rite required that the head of one screw be positioned somewhat above the level of the plastic material so as to permit movement of springs for bulb replacement. This was easily solved by driving a P-K Type "F" Screw to the bottom of a plain, untapped hole and backing it off one-half turn. Dependable security is assured because of the tight engagement resulting when a P-K Screw cuts its own close-fitting thread.

Not only are inserts and tapping operations eliminated by the Parker-Kalon fastening method, but more and more manufacturers, like the producers of Time-Rite, are discovering in P-K Screws the answer to knotty assembly problems — the way to more efficient production methods. With P-K Self-tapping Screws parts can often be eliminated or combined; breakage and spoilage reduced; substantial savings secured on the cost of molds for plastic parts.

In seven out of ten cases, products can be assembled *faster, stronger, cheaper* with P-K Screws. With savings like these in prospect, isn't it common sense to review your present fastening methods? Ask a P-K Assembly Engineer to examine your assembly. Or, mail assembly details to us for recommendations. Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.

*REG. U. S. PAT. OFF.

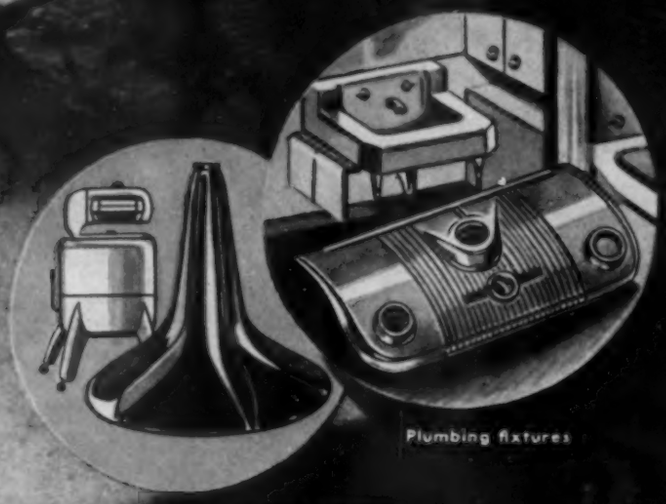
Sold Only Through Accredited Distributors

PARKER-KALON

P-K*

SELF-TAPPING SCREWS

A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY



Plumbing fixtures

Washing machine agitators

Automobile instrument panels

IF IT'S A BIG PLASTIC PART... GENERAL AMERICAN CAN BUILD IT BETTER!

YOUR PRODUCT ?

Refrigerator door trim

An impressive battery of the world's largest injection molding presses

General American has the engineering skill, the creative imagination, and the equipment to manufacture large and complex plastic parts.

Waiting to serve you at General American are batteries of large-volume injection molding presses, including the 32-oz. type, and compression presses ranging up to 500-ton, 1000-ton and 2000-ton capacities. That means *volume*—a smooth flow of plastic parts to your production lines.

Submit your plastics problems to us for design, engineering and prompt quotations.

PLASTICS DIVISION
GENERAL AMERICAN TRANSPORTATION CORPORATION
135 South La Salle Street • Chicago 90, Illinois

CLIP AND FILE THIS PAGE FOR FUTURE REFERENCE

PRODUCT	COMPOSITION	B.P. @5mm	SP. GR. @30/30°C	LOW-TEMP. PERFORMANCE	COMPATIBILITY VINYLS	COMPATIBILITY CELLULOSE ESTERS†	COMPATIBILITY SYNTHETIC RUBBERS	OTHER CHARACTERISTICS
"PLASTOLEIN" X-55	diethylene-glycol dipelargonate	229°C	.9640	Excellent	Good	Good*	Excellent	"Plastolein" X-55 has good color (light straw), moisture resistance and working properties.
"PLASTOLEIN" X-58	dioctyl azelate	237°C	.9184	Excellent	Excellent	Good*	Excellent	These two water-white esters of azelaic acid are recommended particularly for transparent, clear films. Impart excellent tear strength. Suggested also for Organosols & Plastisols. Economical . . . less plasticizer per unit of resin.
"PLASTOLEIN" X-508	dihexyl azelate	230°C	.9319	Excellent	Excellent	Good*	Excellent	
						*Except for cellulose acetate		
"PLASTOLEIN" X-548	A complex fatty ester	Decom-poses at B.P.	.9546	Fair	Fair	Ethyl Cellulose Only	Excellent	A low-cost plasticizer, light yellow in color, X-548 was developed especially for Buna N mixes. However, when blended with small amounts of primary plasticizer, it is completely compatible with vinyls giving good performance.
"PLASTOLEIN" X-545	Tetrahydro furfuryl oleate	240°C	.9279	Excellent	Good	Good	Excellent	Emery's X-545 exhibits improved odor, color and color stability for this type of plasticizer. Outstanding for internal lubrication.

LOW-MOLECULAR WEIGHT ALIPHATIC ACIDS

PRODUCT	FORMULA	COMB. WT.	ACID VALUE	SP. GR.	SOLUBILITY-TYPICAL REACTIONS	USES
"PLASTOLEIN" L-110	$C_7H_{14}(COOH)_2$ Azelaic Acid	93 to 97	575 to 600	1.038 @110°C	Azelaic acid is a buff colored solid, insoluble in cold but infinitely soluble in hot water, in alcohol and polar solvents. Reactions are typical of dibasic acids.	Azelaic forms soft alkyds. Recommended for manufacture of plasticizing resins, its esters also are excellent plasticizers.
"PLASTOLEIN" L-114	C_8H_{17} COOH Pelargonic Acid	145 to 150	375 to 385	.923 @15.5/15.5°C	A mono-basic acid, very slightly soluble in water but soluble in alcohol and most organic solvents. Forms salts, esters, acid halides, amides, etc. Also available in a purified form, L-288, for perfumes.	Esters of pelargonic acid make good plasticizers while the acid can be used in modification of alkyds, and in the manufacture of essential oils, pharmaceuticals, etc. Recommended wherever short chain saturated aliphatic acids are required.

SPECIAL FATTY ACIDS

PRODUCT	COMPOSITION	TITRE	F.F.A. (as oleic)	ACID VALUE	IV	COLOR GARDNER	TYPICAL CHARACTERISTICS
"PLASTOLEIN" DD	"Emersol" processed† Vegetable Fatty Acids (Soya type)	5°C max.	98 to 100	195 to 200	145 to 155	4 max.	Much faster drying and higher in amounts of polyunsaturates, than conventional fatty acids of this type, DD is considerably less costly. Exceptionally stable to heat and light, DD is recommended for air-drying and baking alkyds.
"PLASTOLEIN" AA-D	"Emersol" processed† Vegetable Fatty Acids (low linolenic content)	5°C max.	97	192	135 to 140	2 max.	Recommended especially for light-colored finishes, air-drying and baking alkyds. High I.V. but low linolenic content combines excellent drying characteristics with exceptional color stability.

†"Emersol" Process—Trade mark of Emery's patented process for separating and purifying fats and fatty acids.

"PLASTOLEIN" (Dimer Acids)—During 1948, Emery will begin production of dimer acids in quantity. These dimers are unsaturated C_{36} dibasic acids made by "cross linking" 2-C_{18} unsaturated acids through double bonds, leaving two ethylenic linkages and two reactive carboxyl groups in the structure. A typical analysis shows an acid value of 188; I.V. 90; combining weight 300 and light color. Samples are available for laboratory and pilot plant investigations.

This constitutes a partial list of the fatty acids, derivatives and other products made from them which, with the exception of the "dimers", are in full scale production at Emery Industries and which were developed to fit some of the unusual requirements of "flexible" resins and resinous films. We invite your inquiries and comments on your exact requirements.

EMERY INDUSTRIES, INC.
CAREW TOWER • CINCINNATI 2, OHIO

MODERN PLASTICS
VOLUME 25 DECEMBER 1947 NUMBER 4

It had to be tough!

Ethyl cellulose had many uses pre-war—but not as a molding material. War-time development of the V-T fuze nose, which required the electrical and mechanical characteristics of the material, brought forth an array of new knowledge about molding techniques. Now these better molding methods, plus improved formulations, are gaining acceptance for ethyl cellulose in numerous new applications

IF A GIRL instead of a plastic were named "Ethyl Cellulose," and if that girl had characteristics and a history parallel to those of the plastic, she would be a combination of Cinderella and Superman's sister—a glamorous tomboy. Very light in weight for her size, she would be an expert in Judo, would ski in her bathing suit, would swim in December. She would be capable of the hardest drudgery while looking like a Hollywood star. She would have had a magnificent war record; yet would be finding rehabilitation difficult. She would be fairly expensive to take on a date but would do her escort proud. She would never engage in tasks of doubtful usefulness. And today her popularity would be increasing.

The metaphor had better be dropped right here. Ethyl cellulose as a commercial plastic in the United States was only 12 years old last October! The material was first proposed as an industrial possibility in 1912 by Leuchs in Germany, Lilienfeld in Austria, and Dreyfus in France. Lilienfeld was granted U. S. patents on it in 1916 and 1917. It was first made in this country by Hercules Powder Co. in 1935, followed by Dow Chemical Co. in 1937.

Earliest mention of ethyl cellulose in MODERN PLASTICS was in an article by D. R. Wiggam, Hercules Powder Co., in the October 1936 issue, page 31. He discussed its toughness, its low specific gravity of between 1.11 and 1.14, its ultraviolet resistance ($^1/_4$ the discoloration of nitrocellulose, $^3/_5$ that of cellulose acetate), its low moisture absorption of 3.4%, its ability to mix with amorphous waxes and raise their melting points, its ease of manufacture, and its affinity for various plasticizers.

Exactly a year later[1] Donald A. Gibb, Dow Chemical Co., presented ethyl cellulose as "an answer to the demand for a material having new and different characteristics which will permit the enlargement of the industry into virgin fields."

From the start this plastic was not offered as com-

[1] Ethylcellulose—a new plastic," by Donald A. Gibb, MODERN PLASTICS *15*, 23 (Oct. 1937).

1—Carton in which mechanical plastic car is sold can be converted into a toy garage with swinging doors

2—Under side of toy car molded of ethyl cellulose shows motor housing and "peened-in" axle

3—Toy car disassembled to show the various ethyl cellulose parts of which it is constructed. Even the gears and shafts of the spring motor are molded of plastic. Note how design duplicates appearance of a real car

PHOTOS 4, 6, 7, 9-11, 13-15, COURTESY CELANESE CORP. OF AMERICA

4—Toughness of ethyl cellulose is an advantage in molding radio cabinets which must take abuse

petition to existing resins, but was given new tasks to perform. Gibb stressed the fact that ethyl cellulose used lower amounts of plasticizer than other cellulosics and that the plasticizers could be introduced by the aid of heat and mechanical working alone with no intermediate colloiding step. Thus, the plasticized material had all the toughness of its cellulose base while retaining through life all its small amount of modifier. Its low softening point and high melting point, its toughness at low temperatures, its stability to light, and its low moisture absorption caused Gibb to predict for it a brilliant future.

Between 1937 and 1941 ethyl cellulose was put through the whole range of application investigation. It was applied to textiles to stiffen them. It was made into a type of lacquer to prevent offsetting of inks from printed surfaces. It was made in sheet form for transparent packaging. It was used to coat wire. It was mixed with other resins—but not very successfully. Inks were made from it. Cigarettes were tipped with it to bind the loose ends of tobacco.

Very little injection molding was done with ethyl cellulose in those early years. In the first place it was expensive; in the second place those early formulations didn't mold easily. A lot of careful drying of powder had to be done if pieces were to come out well finished. Colors were far from satisfactory. For all their impact and torsion strength the molded pieces often had a soft surface, easily scratched. Their gloss was frequently poor. Mold shrink was serious. Cycles were long.

War caused molding advances

So until war needs brought about improved ethyl cellulose molding powders and a better knowledge of how to mold them, the material was used in other ways—some of them of great and continuing importance. Mixed with wax it was used for dipping machine parts and tools to prevent them from rusting and to eliminate the need for greasing before packaging; the coating was stripped off the product on arrival at destination. Some sheet ethyl cellulose went into packaging and into laminations. In lacquer form the material had many uses. As wire coating, once it was properly plasticized, it proved tough and flexible at extreme temperatures. One of the few big applications of ethyl cellulose in molded form before the war was in tool handles.

Fuze gave material recognition

Then came the war—and plastics specifications were so severe that ethyl cellulose, regardless of curses from molders, had a chance to make good. It was first

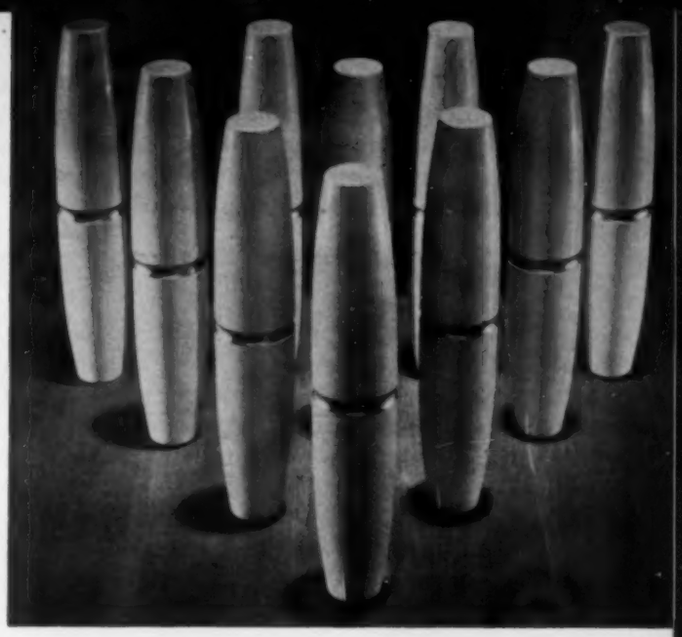
specified for the Signal Corps flashlight case and proved so good that at least two flashlight makers now use it as their standard material. Later, when ethyl cellulose became critical, deviations from original specifications were allowed to permit other material to be used. Gas masks, machete handles, lanterns—these were other war-time applications. But it took the VT or proximity fuze to give ethyl cellulose recognition as a molding material.

Five times as effective as mechanical time fuzes on artillery shells, this pint-sized unit[2] ranks second in war-time importance only to the atomic bomb. Ethyl cellulose was chosen for the nose because of its dielectric qualities, its toughness, and its dimensional stability under extreme anti-gravity punishment.

Probably more was learned about making and molding ethyl cellulose during the VT fuze program than would have been learned in a decade of ordinary development. In the course of this project the molding cycle on the material was reduced from 15 min. to 70 sec. as molding compounds improved and standard procedures developed. It was found that high temperatures (450 to 550° F.) and low pressures (under 1000 p.s.i.) with mold temperatures of 110 to 150° F. worked best. Infrared drying of molding powder was made standard practice. Mold-makers were taught to respect the mold shrink of ethyl cellulose (0.002 to 0.007 in. per in., depending on formulation, die design, and molding conditions). Ethyl cellulose, incidentally, had another use in the VT fuze: it served as a sealing compound for the miniature battery.

The VT fuze program continued long after V-J Day,

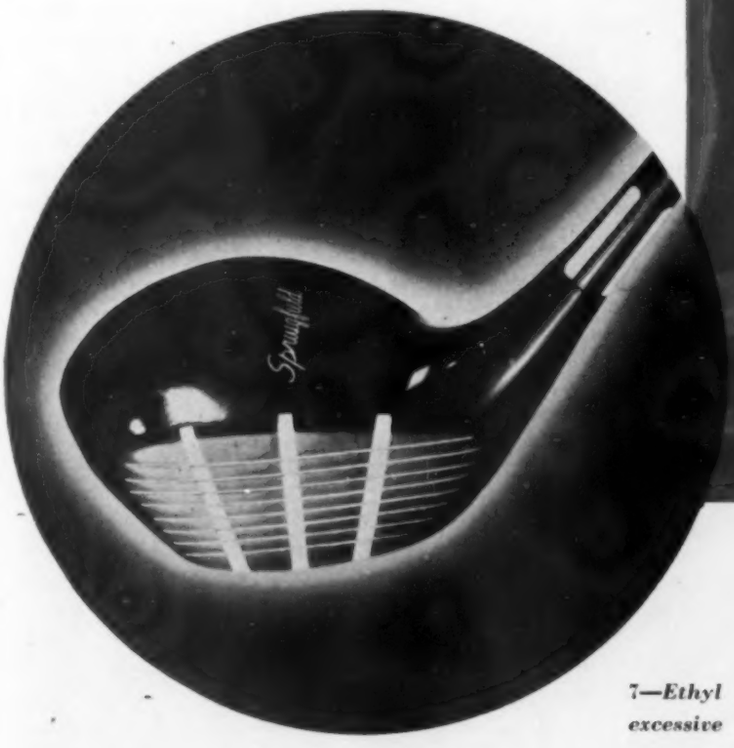
[2] "Proximity fuze taught new techniques," by Charles Kleiderer, MODERN PLASTICS 23, 133–136 (Nov. 1945)



5—Layers of ethyl cellulose 3/8 in. thick molded over wood make long lived bowling pins

PHOTO, COURTESY TERRI LEE CO.

6—Unbreakable dolls, rapidly molded of ethyl cellulose, are painted in lifelike colors



7—Ethyl cellulose golf club heads withstand excessive use and intensive weathering tests

so ethyl cellulose was not available in quantity for molders to use in peace-time products until fairly recently. The molders and their customers considered. And while they considered, consumption dropped.

Assets of ethyl cellulose

For the affirmative they considered these facts: a) ethyl cellulose has great impact strength, ranging from 5.6 to 11.6 ft.-lb. per in. of notch; b) impact strength is retained at temperatures of −40° F; c) moldings of ethyl cellulose are dimensionally stable and will retain their flexibility over long periods under extreme atmospheric conditions, since only 10 to 20% plasticizer is used; d) its specific gravity is about 1.12 which compares favorably with other light thermoplastics—low density means greater volume for a given weight; e) with a low softening point and a high melting point, molding cycles are very fast, making for economy; f) light—visible or ultraviolet—has little discoloring action on ethyl cellulose; g) it is stable to alkalies and to salt solutions, while its acid and heat resistances depend on stabilizers; h) ethyl cellulose has excellent electrical properties; i) it is made by seven manufacturers[3] in a wide range of formulations and these new compounds are much easier to mold than those of even two years ago.

Drawbacks to use

For the negative, molders and customers considered that: a) ethyl cellulose molding powder costs 60 cents per lb. (58 cents in carloads), so is not a material to guess about; b) while all colors are obtainable, water clears and translucent pastels are difficult to produce; c) the material must be molded very hot to prevent peeling—it must be completely dry or surface will be affected—mold temperatures are critical; d) acid resistance of ethyl cellulose and oxygen resistance above softening temperatures are poor; e) while the basic material is compatible with a wide variety of resins and plasticizers the molding powder is not—a thorough clean-out is necessary when changing materials.

That the affirmative won is indicated by the products illustrated herewith. These are new jobs. A study of them will show that ethyl cellulose has been accepted as a molding material for uses where toughness at all temperatures is required in combination with beauty. It will show that molders' techniques and improved formulations have overcome past difficulties. It will point the way to new applications.

Self-propelled toy car

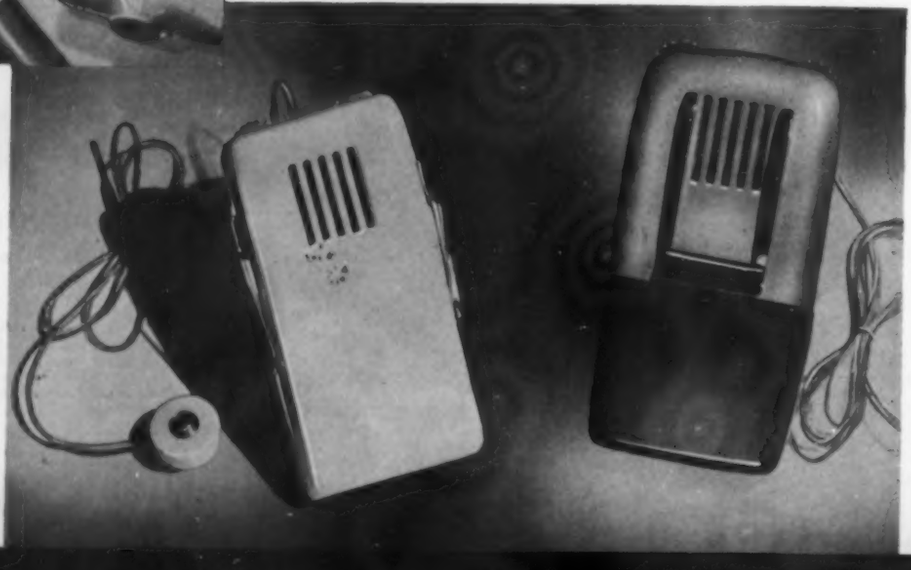
The mechanical car (Figs. 1, 2 and 3) made by the Clinford Corp., West New York, N. J., and designed by Philip A. Derham and Associates, Inc., Rosemont, Pa., is the nearest thing yet to an all-plastic self-propelled toy of authentic appearance. There are only two metal parts: the small spring and the front axle. Here Chemaco's ethyl cellulose competed with stamped metal in a quality product that sells, packaged, at $1.00 retail. Each car contains 140 grams of material in 17 molded parts (Fig. 3) including the wheels and gears of the motor. The car is rustproof, shockproof, and has been dropped 15 ft. to a cement floor without damage.

In making molds for both body and gears, the mold shrink of ethyl cellulose was taken into consideration so that tapering of cavities was not necessary and gears turn out straight-walled. Body detail is more authen-

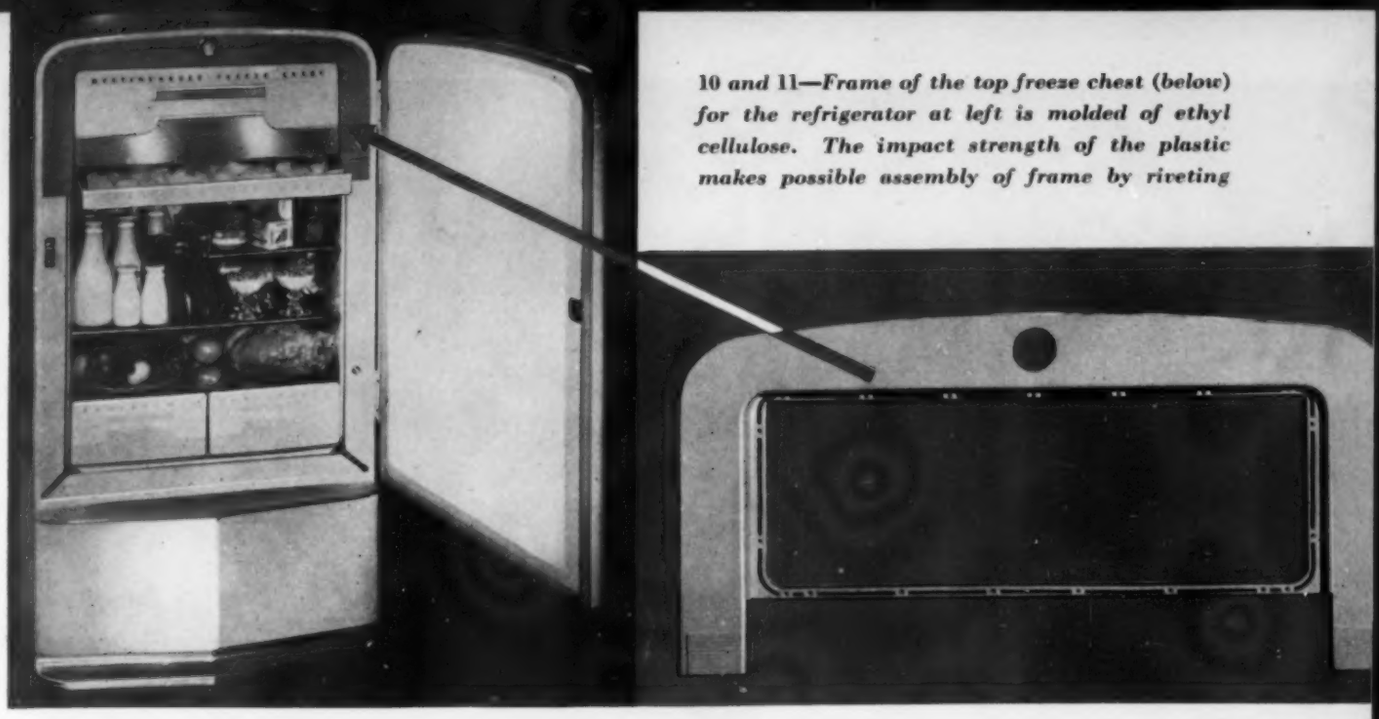
[3] Dow Chemical Co., Celanese Plastics Corp. Chemaco Corp. Nixon Nitration Works, Gering Products Inc., American Molding Powder & Chemical Corp., and A. Bamberger Corp. Both Dow and Hercules Powder Co. produce ethyl cellulose in flake form.

PHOTO, COURTESY HERCULES POWDER CO.

8—Broom caps of ethyl cellulose replace metal, are tough enough to take severe punishment, and they will not dent, chip, or rust



9—Noise in hearing aids, caused by rubbing against clothing, is reduced when the case is molded of ethyl cellulose. The lightweight cases have a smooth finish



10 and 11—Frame of the top freeze chest (below) for the refrigerator at left is molded of ethyl cellulose. The impact strength of the plastic makes possible assembly of frame by riveting

tic than it would be otherwise because of the same factor. Degating was easy; gluing in assembly was no problem; finishing is almost nil. The front axle was "peened" onto its support—a feat almost impossible in less tough materials.

The makers and designers foresee a big future in all-plastic power units such as that used in this car, since they will be self-lubricating, safe, and long-lived.

In radio cabinets

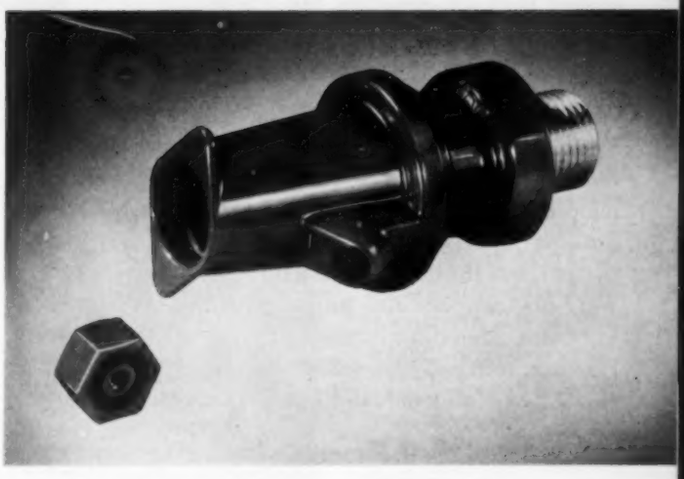
Molded Insulation Co., Philadelphia, Pa., molds the Viz radio cabinet (Fig. 4) from Celanese Celcon. The five-tube receiver chassis is suspended inside the cabinet by means of rubber grommets with only a single screw fastening the chassis to the base of the cabinet. The combination of this chassis suspension and the shockproof cabinet material can take much abuse. Indeed, the manufacturer guarantees it unconditionally for 90 days.

Molded on wood core

An average hardwood bowling pin stands up to between 500 and 700 strings of 10 frames each. But the pins shown in Fig. 5, molded by Northern Industrial Chemical Co., Boston, Mass., for Durable Bowling Pin Corp., Brookline, Mass., stand up to 10,000 strings. They are molded of Celcon $^3/_8$ in. thick over wood cores and have the same weight, size, and "click" as wooden pins. Easier to clean and much longer lived, these pins are the first of several makes to be manufactured of ethyl cellulose.

Dolls can take abuse

For the Terri Lee Co., Lincoln, Neb., the dolls shown in Fig. 6 are molded from Dow's Ethocel and also Celcon by Tip Top Products Co., Omaha, Neb. Injection molding gives the makers finer detail than could



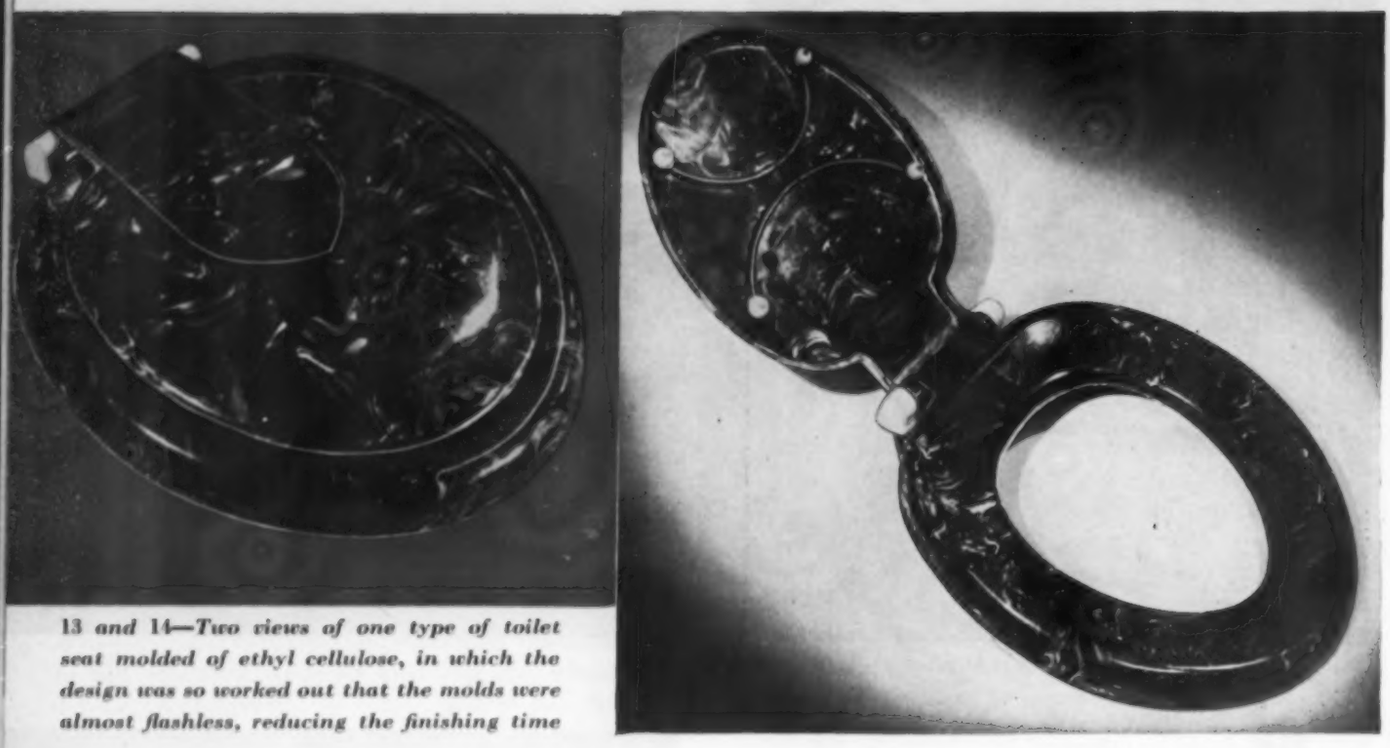
12—Thermos jug spigots are rapidly molded of ethyl cellulose by high temperature injection

be obtained by any other method of doll manufacture, gives them an unbreakable doll that will stand extremes of temperature, gives them high-speed production, gives them a doll that a child may bathe, and finally gives a lifelike depth of color after the lacquer has been applied.

The all-ethyl-cellulose doll is made with five movable parts: head, arms, and legs. Color is applied by air-brushing knees, cheeks, and hands with a bleeding red lacquer; then spraying all parts with skin-tone lacquer; then oil-painting lips and eyes. Initial die cost, of course, was high; but there will be no losses from breakage and inferior parts such as are common in many other composition dolls.

Golf club head takes 6000 shots

Celcon was used by Prolon Plastics Div. of Pro-phy-lac-tic Brush Co., Florence, Mass., to mold the golf



13 and 14—Two views of one type of toilet seat molded of ethyl cellulose, in which the design was so worked out that the molds were almost flashless, reducing the finishing time

club head shown in Fig. 7 for Sporting Goods, Inc., Springfield, Mass. Low specific gravity of the material, density, and toughness were the reasons for choosing ethyl cellulose. In a 6000-shot test on an automatic driving machine three steel shafts were broken, but the head suffered no ill effects. These heads were also successfully subjected to intensive weathering tests, including exposure to temperature extremes ranging from −20 to +200° F. Reports indicate that the tested club heads did not deteriorate.

Broom caps

Broom caps have never been completely satisfactory in metal. Denting, rusting, and chipping of enamel spoiled their appearance and made them destructive to use. Figure 8 shows how Cacoosing Industries, Sinking Springs, Pa., used Chemaco ethyl cellulose to do the job better in plastics. These caps can take any punishment, and are safer and cleaner to use.

Lightness advantage in hearing aids

Designed by Henry Dreyfuss, the Western Electric hearing aids (Fig. 9) are molded from Celcon and Chemaco ethyl cellulose by A. K. Tool & Machine Co., Union, N. J., and Erie Resistor Corp., Erie, Pa. Smooth finish, light weight, dimensional stability, and reduced clothing noise were obtained. On the model at right the clip is of ethyl cellulose also, its thin wall section strengthened by a plating of metal.

Frame of refrigerator chest

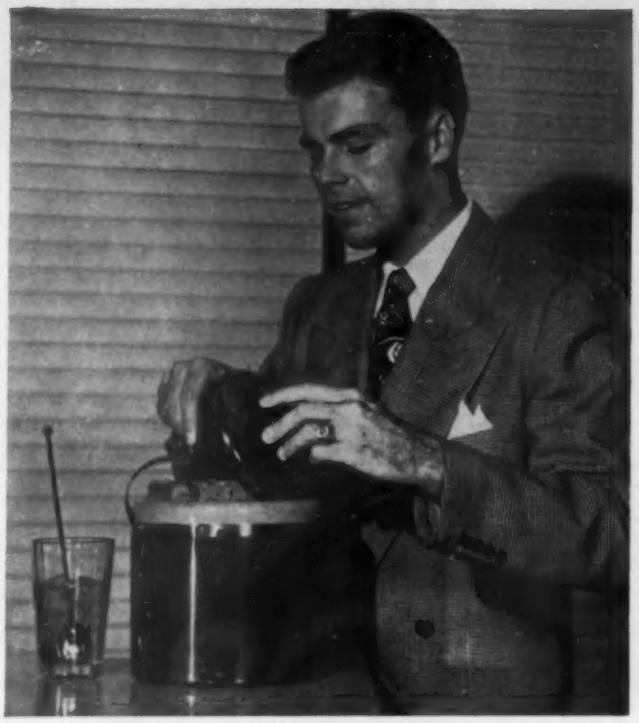
The new Westinghouse two-temperature refrigerator has two storage compartments maintained at different levels of cold. Ethyl cellulose was used for molding the frame of the top freeze chest shown in Figs. 10 and 11. Here impact strength for assembly by rivets, low thermal conductivity, and retention of shape were the reasons for the choice. A special "Apicream" shade for the plastic parts was engineered by Faber Birren, noted colorist. Molding is by Standard Products Co., Detroit, Mich.

Spigot tricky molding job

When Knapp-Monarch Co., St. Louis, Mo., selected Injection Molding Co., Kansas City, Mo., to mold the thermos jug spigot shown in Fig. 12, Ethocel was chosen as the material because of its impact strength at low temperatures. A hard-flow formulation was used. This was a difficult job from the standpoint of mold design, because of the knurled aluminum insert and unavoidable double undercuts; but retracting pins were used and cycles were rapid because the material was injected at high temperature.

As in the case of flashlights, several different makers are using ethyl cellulose in toilet seats. Figures 13 and 14 show a new one molded by Arrow Plastics, Corp. Passaic, N. J., out of Celcon for Plastic Appliance Mfg. Corp., Paterson, N. J. The design permitted the wide gates most suitable to rapid molding of this material, and the molds were almost flashless, making for ease of finishing.

Tool handles, ice buckets (Fig. 15), baby's bottle containers, razor handles, vacuum cleaner parts—the list of new applications of ethyl cellulose grows daily. Extrusions of a special new Ethocel formulation by Yardley Plastics Co., Columbus, Ohio, are undergoing tests as wands for vacuum cleaners. Tough as metal, they weigh a fraction as much, yet are easier on wood



15—*Good low-temperature characteristics of ethyl cellulose makes it ideal for ice buckets*

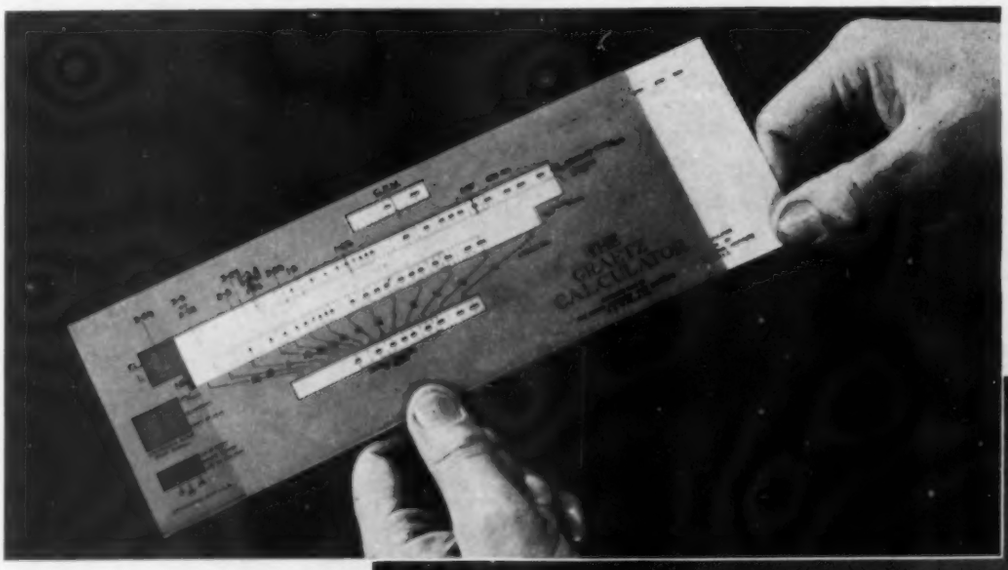
finishes they happen to hit. They are also colorful. It is no secret that a major test of ethyl cellulose in telephone bases and receivers is now being conducted.

Aside from molding, this material continues to progress in dip coats and foils for packaging, in coatings, and in sealants. Special mention should be made of the printing being done on ethyl cellulose sheet with inks made from the same material. According to the Hopp Press, Inc., New York City, who made the calculator (Fig. 16) and map overlays (Fig. 17) on Ethocel sheet with inks made by International Printing Ink Div., Interchemical Corp., Chicago, Ill., there is such a rapid and complete bond between the ink and the sheet that four or five colors may be printed in one day and the ink will never rub off.

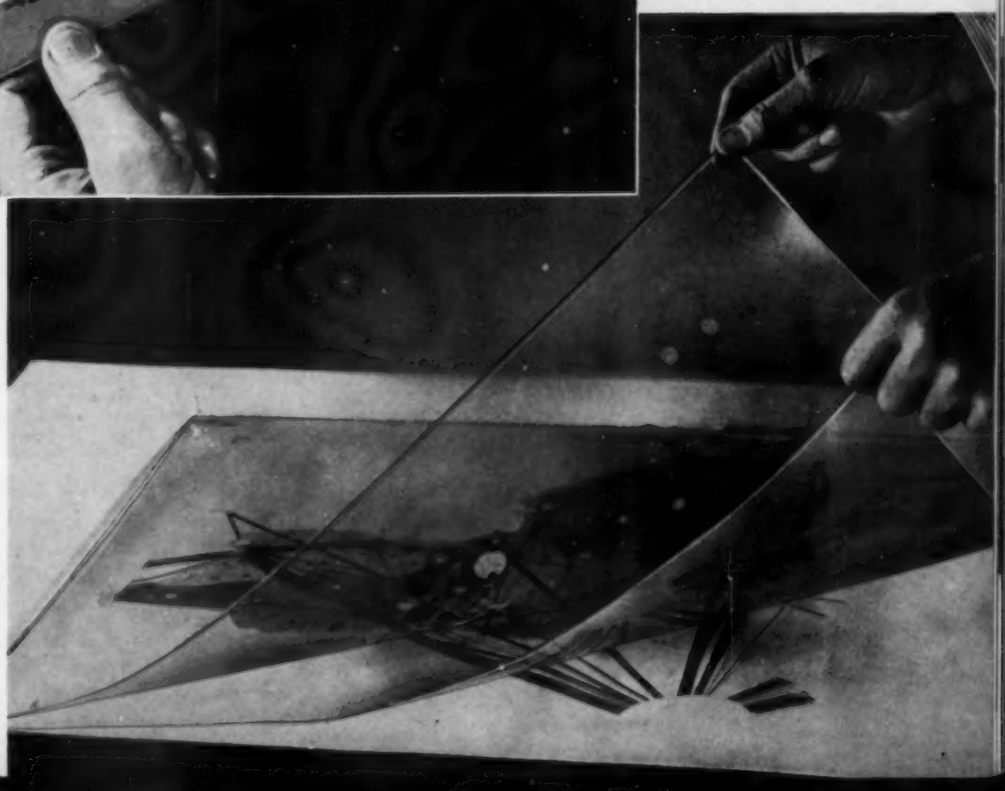
Things to come

Early in 1948 a new flooring made of ethyl cellulose film filler will be announced. In the low-cost range, it will be troweled on and then smoothed down, according to present plans of the maker. Another formulation can be sprayed on wood or concrete. Another early certainty is an ethyl cellulose spray coating for wallpaper, to make it stainproof.

These things were long expected. Not so certain a year ago was the increased use of ethyl cellulose in molded applications. In that field this Cinderella-Superlady plastic had to prove both useful in peace-time and reasonably easy to get along with in a molding plant. It is to the credit of both the material makers and the molders that the gal is now accepted.



16—*Slide rule calculators made of printed ethyl cellulose sheet remain clean and readable despite constant handling and exposure to dirt*



17—*Multi-layer maps use sheets of ethyl cellulose printed with inks that are fast drying, will not rub off*

4-COLOR PLATE, COURTESY MARVANITY CO.

Materials for facials and manicures are readily available in this new tub dressing table

Bathtub dressing table

by DOROTHY MONROE

Pre-production survey gave preferred color, style, uses, and retail outlets for this white polystyrene bathroom fixture

THE ADAGE "look before you leap," when applied to business, can mean the difference between profits with a product that sells and failure with one that collects dust at store counters. Marvanity, a bathtub dressing table recently put on the market and consisting of three white polystyrene boxes in a chrome cradle, proves the wisdom of such "looking."

Before the Marvanity Co. of Dallas, Texas, started production on this bathroom fixture, Texas Research Associates spent an entire year conducting a survey to test the design. Questionnaires were sent to housewives presiding over different types of homes.

White preferred over color

The company had an idea of its potential market when 81½% of the women replied that they preferred a tub to a shower. Great interest was shown by 74½% of the women at first sight of the Marvanity. An overwhelming majority preferred a white fixture. Further questions showed various uses to which the fixture could be put. The idea of having a place to put jewelry appealed to 64½% of the women queried since 63½% admitted they forgot to remove jewelry before they stepped into the tub. Affirmative replies were received from 77% saying they would like the Marvanity for storing cosmetics, for facials and manicures, for relaxing and reading. The smooth, rounded frame had great appeal as a stocking dryer. Many women suggested multiple uses for the end boxes elsewhere in their home.

The Marvanity, which was designed by Warner Hoople, is four separate units: chrome plated steel rack with plastic handles, adjustable in size from 25¼ to 39 in., that will fit any tub; two identical end boxes

If milady likes to relax with a good story, she can open center compartment and insert periodical in rack inside lid

of polystyrene; and a larger center box of the same material. The end boxes are $5^5/_8$ in. wide, $9^7/_8$ in. long and $4^3/_8$ in. deep, while the center box is $10^1/_2$ in. wide, $9^7/_8$ in. long and $4^3/_8$ in. deep.

The lid of the center box has an attractive coat of arms silk screened on in red and gold. Inside the top is a polished plate glass mirror set deep in a plastic frame. Two small clips at the bottom of the lid form a rack for holding magazines.

Unit weighs 5 lb.

Polystyrene was selected because it met the important requirements of bathroom fixtures—ability to be cleaned easily and to withstand exposure to extremes of bathroom temperatures, moisture, cleaning agents, and cosmetics containing alcohol. In addition the material possesses the advantages of high glossy finish and light weight. The finished Marvanity weighs only $5^1/_2$ lb., enabling it to be lifted and moved about the house with ease.

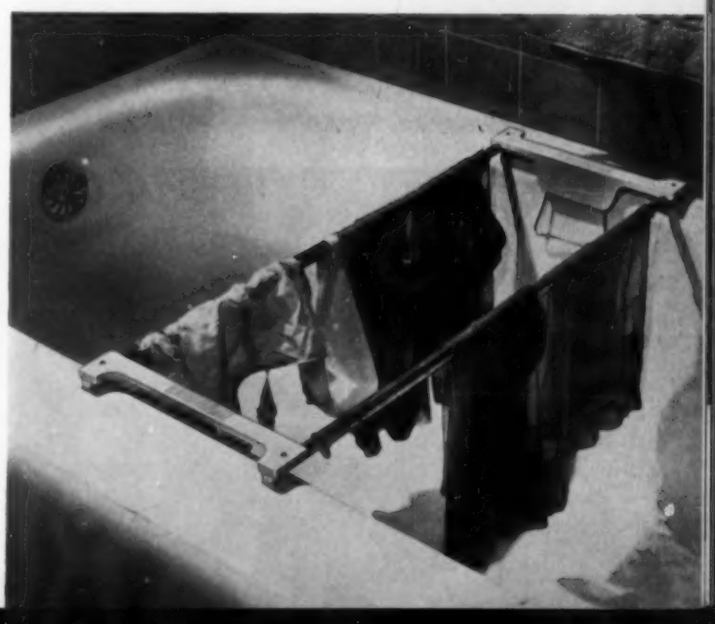
Plastics Mfg. Co. of Dallas, Texas, injection molds the boxes and handles of Lustron polystyrene, Styron, and Bakelite polystyrene. The end boxes are made in two parts with the lids attached by means of stainless steel hinge pins. The center boxes are made in three parts; the frame holding the mirror in place is molded separately.

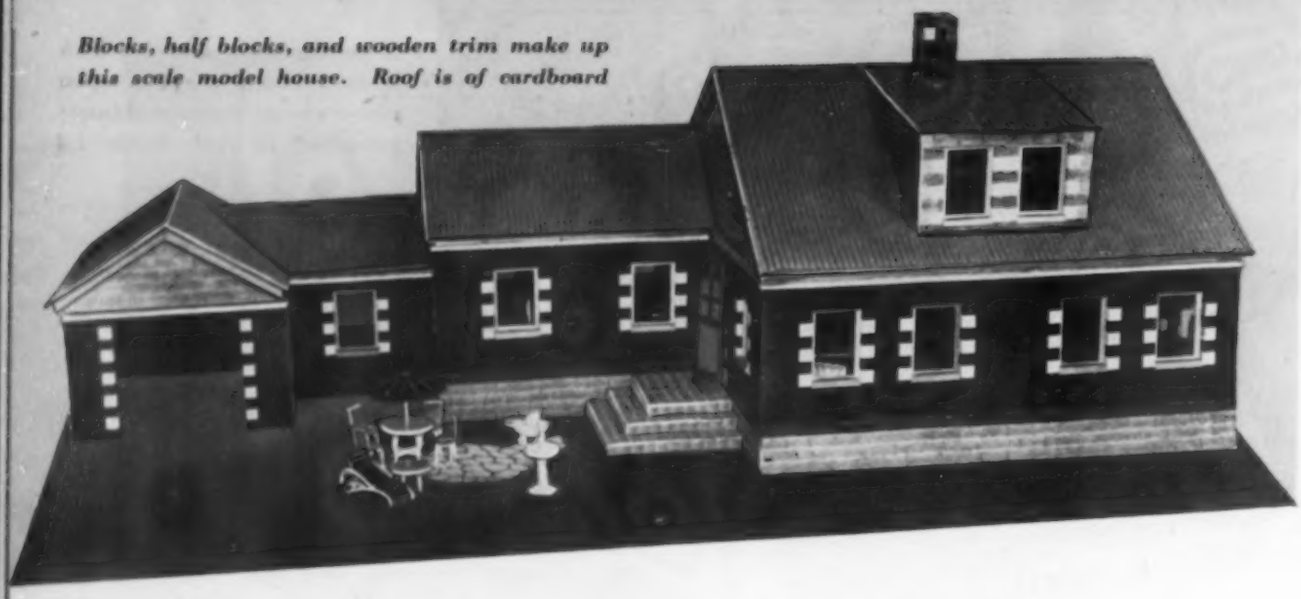
The completed fixture is packaged in an attractive Craftboard box displaying the Marvanity crest. Labels are printed both in English and Spanish, since wide distribution is contemplated in Mexico and South America.

Distribution is through leading department stores because questionnaire answers showed 76% of the women expected to find Marvanities in department stores, with $10^1/_2$% favoring drug stores, and $13^1/_2$% other stores.

Removable boxes of table are molded of white polystyrene, selected for glossy finish, light weight, and its ability to resist chemicals

The chrome plated steel frame, adjustable to any size bathtub, can be used as a lingerie dryer. Its smooth surface prevents snagging

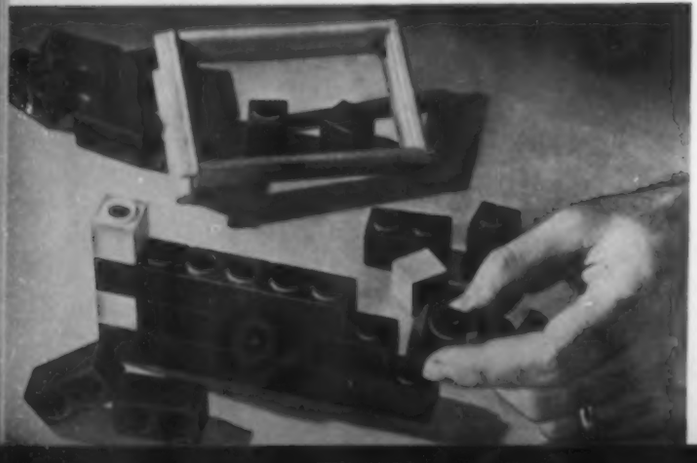




Blocks, half blocks, and wooden trim make up this scale model house. Roof is of cardboard

Cold molded model building blocks

Above—Same blocks are used for inside walls. Below—Blocks are self-locking and need no pegs



Model houses can be built to accurate scale with strong, self-locking blocks

PEOPLE who are planning to build houses like to know what they are going to look like. But it is a rare layman who can get a clear idea from an architect's blueprint. The solution, many people believe, lies in scale models.

Such scale models can easily be assembled, rearranged, and disassembled with model building blocks molded by the Mebb Co., Lyndhurst, N. J. These blocks are accurately proportioned to 8 by 8 by 16 in. cinder building blocks on a scale of 1 in. to 1 foot. Unlike most model blocks now on the market, they require no pegs, nails, tape, or adhesives, but are held rigidly in place by circular male and female mating sections on the top and bottom of each block.

Low cost, short cycle

In order to cut costs and production time, and still produce a block with the necessary strength and weight, cold molding was selected as the method of production. A Defiance #20 press is used to mold the blocks under 50-ton pressure in a $1^1/_2$-sec. cycle, and no preheating or afterbaking is required. The cold molding material, Gladite, is furnished by Myler Plastics Corp., Jersey City, N. J.

Because the number and type of blocks needed by any user will depend upon the size and type house planned, the Mebb Co. does not intend to sell any "sets." The blocks and half-blocks (for finishing ends of walls) are available in any quantity. Wooden strips, grooved to fit the blocks, are also available for framing windows or doors.

Furfural in phenol resin laminates

Phenol-base varnish has better electrical qualities than varnish with cresol base—and the supply is more certain

by HARRY KLINE*

DEVELOPMENT of a 100% phenol-base varnish has liberated laminators of electrical insulation materials from their long dependence on cresol and the uncertainties of cresol supply. The use of furfural in combination with phenol has resulted in a varnish with better electrical and mechanical qualities than are usually obtained with a cresol-base varnish.

The cresol most often used in these latter varnishes is a mixture of ortho cresol, meta cresol, and para cresol, in which the ratio of the constituents has to be kept within a narrow range. This is sometimes difficult because the coal tars used vary in composition, depending on carbonization temperatures and other factors.

In addition, the quantity of cresol available has always been limited. The use of petroleum cresylic acid has helped some, but if laminators had been forced to depend on cresol alone for dielectric laminates, their production would have been severely curtailed.

Modified phenol shows shortcomings

Because of the dual difficulties of short supply and lack of uniformity in cresylic acids, resin industry technicians have long been experimenting with the use of chemically pure phenol, which is far more available than cresol. In many applications, the use of phenol presented no difficulties whatever. But, even with straight phenol-formaldehyde varnishes made under the most ideal conditions, the industry was unable to produce laminates equivalent in dielectric strength, power factor, etc., to those produced with cresol.

The best the resin industry was able to do until recently was to produce so-called modified phenol varnishes by adding a diluent with good dielectric properties to the phenol resin. These modified varnishes did not yield the results possible with a 100% phenol resin; their properties were affected by the inert diluents, which were not resins and had no bonding properties.

The hope of resin technicians has always been to develop a 100% phenol-base varnish which would produce laminates as good electrically and mechanically as those produced with the best cresol varnish. This hope has been realized during the past year by using furfural in the resin reactions.

Many patents had previously been issued on the use of furfural in the production of phenolic resins. But in spite of the tremendous amount of research carried out in this field, as evidenced by the number of patents, a survey conducted in the laminating field 3 years ago showed that no phenol-furfural laminating varnish was commercially available. Some laminators, however, were adding furfural to varnishes as a modifying agent, while others had used phenol-furfural varnishes which they themselves had produced. A number of these laminators expressed a desire to try out a phenol-furfural laminating varnish, provided it possessed the properties they required.

As a result of this survey, experiments were started to develop a 100% phenol resin which would prove as good dielectrically as a 100% cresol varnish. First it was necessary to determine just what type of varnish could be made by using furfural in the resin reaction. Varnishes were produced, and laminates prepared and tested for electrical and mechanical properties.

In addition to obtaining the desired dielectric properties, it was important to develop a varnish which was practical from a production standpoint—a varnish which would dry in the treating machine in approximately the same time and under the same temperature as a good cresol varnish, and one which would cure in the press under similar conditions.

The product finally evolved is a 100% phenol-base varnish which produces laminates that are as good electrically as those produced with the best 100% cresol varnishes—and somewhat better mechanically. Hundreds of thousands of pounds of this varnish have

* Manager and technical director, Phenolic Plastics Div., Reichhold Chemicals, Inc., Detroit, Mich.

The Plastiscope

News . . . Comment . . . Interpretation

For a compact, succinct survey of happenings in and around the plastics industry, get the habit of reading The Plastiscope every month. This regular department in MODERN PLASTICS Magazine reports industrial news, evaluates these reports, takes you behind the scenes on impending events. The Plastiscope appears on page 200 of this issue.

Table I.—Electrical Properties of 0.075-In. Paper Panel	
Dielectric strength (step by step test)	647 v./mil
Power factor (one million cycles)	0.0358
Dielectric constant (one million cycles)	4.62
Loss factor (one million cycles)	0.165
Volume resistivity	2.11×10^6 megohm-in.

already gone into the production of dielectric laminates for electrical, telephone, radio, and other equipment.

The new phenol-furfural resin is dark brown in color instead of the usual yellow of the cresol varnishes. As a consequence, laminates made with it also turn out dark brown. Purchasers have come to expect yellow laminates, but in the long run dark brown would seem to be as acceptable. For black laminates, the new resin is available with a black dye added.

Advantages of phenol-furfural

The new phenol-furfural varnish has a number of advantages:

1. The laminator is assured of an ample supply, which will not be affected by the recurring shortages of cresol, because the C.P. phenol used in its manufacture is readily available.

Table II.—Mechanical Properties of 0.15-In. Paper Panel	
Tensile strength (lengthwise)	15,750 p.s.i.
Flexural strength (lengthwise)	21,700 p.s.i.
Modulus of elasticity in flexure	1,279,000 p.s.i.

2. The result is a more uniform product because the raw material is C.P. phenol, rather than a mixture of cresol isomers, the properties of which vary.

3. The price on a solids basis is generally less than the prices of cresol laminating varnishes. In addition, the new varnish, sold at 75% solids, is in the same viscosity range as the usual 60% solids content cresol varnishes, so that there is a saving on alcohol.

4. Better mechanical properties, especially tensile and impact strength, are generally obtained.

5. There are indications that the electrical properties of impregnated materials made with phenol-furfural varnish suffer less on storage before curing than is the case when cresol varnishes are used.

6. There are also indications that laminates produced with the phenol-base varnish have less tendency to warp than do cresol varnish laminates.

7. As in all straight phenol varnishes, there is less cold flow than is the case with cresol varnishes. Cresol varnishes contain large amounts of *o*-cresol and *p*-cresol resins which react slowly and tend to act as plasticizers, resulting in more cold flow.

8. Phenol varnishes generally give about 10% better treating machine yields than is possible with cresol varnishes. There is less volatilization in the drying ovens where the solvent is removed from the impregnated materials and the resin advanced to the proper stage. Here again the lower yields with cresols are due to the slowly reactive *o*- and *p*-cresols which form resins which are more readily volatilized. This greater yield naturally tends to reduce the ultimate cost.

Tests on paper and canvas laminates

Six-mil alpha cellulose paper was impregnated with the new phenol-furfural varnish, so as to contain 50 to 52% resin and 5.5 to 6.5% volatiles (volatiles were determined by drying a small sample sheet of the impregnated paper for 10 min. at 160° C. and determining the percentage loss in weight). Two panels, one of approximately 0.075 in. thickness and the other of 0.15 in. thickness, were cured together in a hydraulic press for 45 min., using 100 lb. steam and 1200 p.s.i. pressure.

Electrical and mechanical properties of these paper panels are listed in Tables I and II.

More detailed mechanical tests were conducted on canvas laminates made with 8-oz. duck and impregnating to about 48 to 49% resin and 4 to 5% volatiles. Curing time for a sheet 0.5 in. thick was 45 min., using 100 lb. of steam and a pressure of 1200 p.s.i. The results of these tests are shown in Table III.

Significance of test results

In checking the electrical properties listed in Table I, it should be kept in mind that no high resin surface sheets were used. These electrical properties are in most cases much better than the average N.E.M.A. Standards for electrical grades and fully as good as were obtained from laminates made with the best straight cresol varnishes available and the same alpha paper under the same conditions.

The mechanical properties are likewise much better than corresponding N.E.M.A. Standards and also better than those obtained from laminates made under similar conditions, using the best straight cresol varnishes. For example, a tensile strength of more than 14,000 p.s.i. on $^1/_2$-in. canvas stock is unusual.

Since this phenol-furfural varnish has demonstrated what it can do in the production of the highest grade dielectric laminates, it is evident that the laminating industry no longer has to depend exclusively upon an uncertain supply of special cresols to satisfy the demand of one of its major outlets.

Table III.—Mechanical Properties of 0.5-In. Canvas Laminates	
Tensile strength (lengthwise)	14,650 p.s.i.
Tensile strength (crosswise)	14,450 p.s.i.
Flexural strength (lengthwise)	25,500 p.s.i.
Flexural strength (crosswise)	23,650 p.s.i.
Modulus of elasticity in flexure (lengthwise)	704,000 p.s.i.
Modulus of elasticity in flexure (crosswise)	711,000 p.s.i.
Notched Izod impact (lengthwise-side)	2.41 ft.-lb./in. of notch
Notched Izod impact (crosswise-side)	2.50 ft.-lb./in. of notch
Notched Izod impact (lengthwise-face)	4.37 ft.-lb./in. of notch
Notched Izod impact (crosswise-face)	4.38 ft.-lb./in. of notch
Compressive strength	48,800 p.s.i.
Bonding strength	2,000 lb.

Razor blades housed in plastic

Polystyrene dispenser delivers blades by pressure of thumb and protects the edges from factory to user

Razors are removed from non-refillable polystyrene container by thumb pressure. Note arrows showing direction to eject next blade

A NEW unwrapped razor blade is delivered by a simple thrust of the thumb from Speed-pak, a new polystyrene blade dispenser being put on the market by the Gillette Safety Razor Co. of Boston, Mass. To give this container the proper send-off, the company has launched an advertising campaign with an initial budget of over $1,000,000.

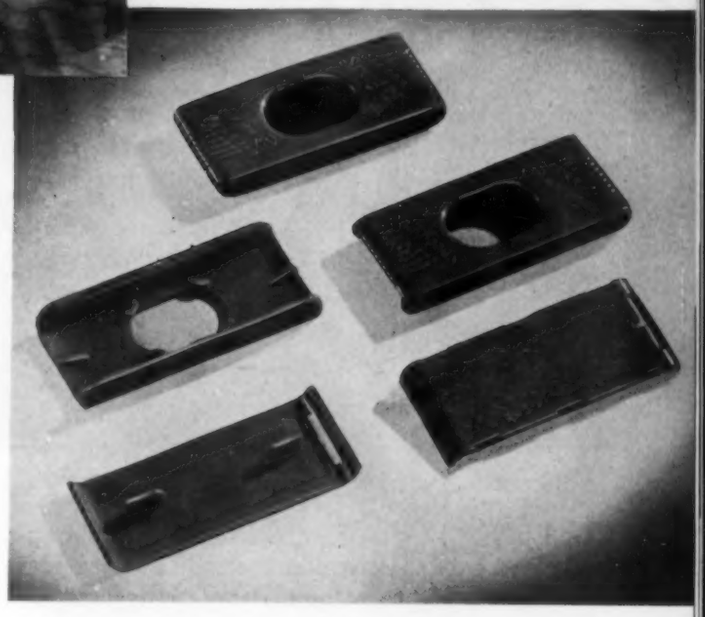
Trade promotion is already under way; nation-wide consumer advertising will be launched on Jan. 1. Complete window display installations will be placed during the week between Christmas and New Year's. This campaign is the result of test sales in key cities which showed a sales increase of 33% the first week Speed-paks were offered, and an increase of 49% the second week.

Two sizes of Speed-pak are being made. Speed-pak 20 is solid blue and holds 20 Gillette Blue Blades. Speed-pak 10, holding 10 blades and with a white top and blue bottom, is being sold with the Super-speed one-piece razor. Both are non-refillable and once the blades in them are used, the cases are thrown away.

Polystyrene selected

Research on the container was started before the war, but actual work did not begin until August 1946. The chief problem was the development of a simple dispenser which could be mass produced and marketed to the shaving public at no increase in the cost of the blades. The material to be used had to be available in sufficient quantity for production of millions of dispensers, light yet sufficiently durable for plenty of handling, and inexpensive. The solution was found in Styron and Lustron polystyrene.

Foster Grant Co., Inc., Leominster, Mass., injection molds the dispenser in two parts. Care was taken in the design to protect the blades. Four nibs molded



Plastic dispenser, top, consists of cover piece with oval opening and bottom piece with two nibs to keep blades from touching sides

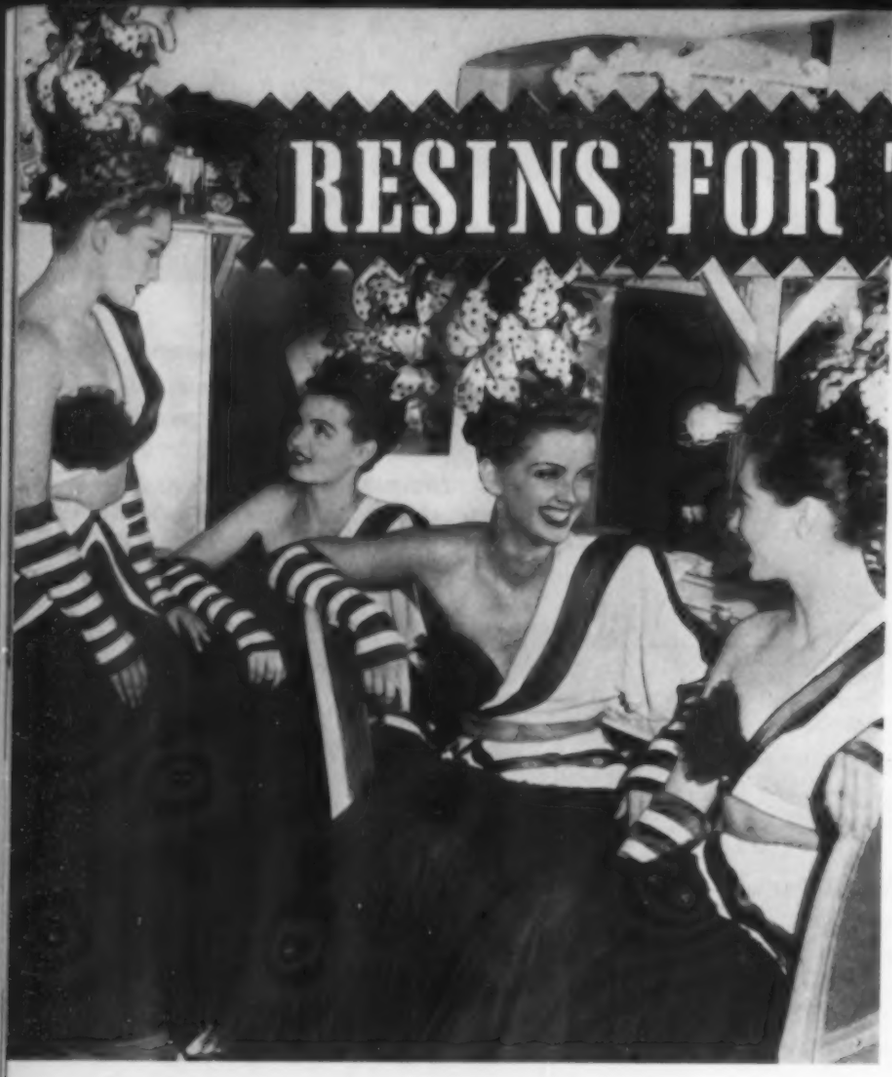
around the oval opening of the top keep the blades from touching the top. A curved metal strip goes between the bottom and the blades and serves as a spring to keep the blades in position for ejection. Two nibs in the bottom go through the openings in the center of the blades and keep them from touching the sides of the container.

Loading a problem

Another problem was the loading of the dispensers at the Gillette plant. The blades are ejected from either end alternately which meant alternate loading. A special machine was developed for this job and the blades were imprinted with arrows to indicate to the user the direction of the thumb thrust.

As each blade is loaded into the Speed-pak, it is sprayed with a thin coating of rust-preventing and antiseptic oil which is invisible to the eye and undetectable to the touch.

RESINS FOR TEXTILES



How and why commercial use is being made of resins to improve characteristics of wool and other textiles

by KENNETH H. BARNARD*

Neither dampness nor humidity will affect the durable crispness of the resin-treated nylon net used in the skirts of these theatrical costumes

MODERN METHODS of finishing textiles commenced only shortly after the end of World War I; up to that time the materials in general use were soaps, starches, sulfonated oils and fats, glues, china clay, and gums.

Even the concept of modern finishing of textiles is new. Formerly the main effort was directed simply at improving the appearance and hand of the fabric, but finishes have now been developed which also improve the use and service characteristics of textiles. For example, control of the shrinkage of wool, retention of crispness in sheer fabrics under conditions of moisture, durability of glazed chintzes when washed, and moisture and stain resistance are typical accomplishments of new resin and other chemical finishes.

These modern finishing processes may be divided into three general types: mechanical finishing such as the controlled pre-shrinking of cotton goods, chemical reaction processes which change the chemical composition of the textile fiber, and, of concern here, processes in which a resin is deposited in and on the fibers.

Formaldehyde reaction products

The two types of resin most widely used are formaldehyde reaction products of urea and melamine. The first commercial use of urea-formaldehyde resin was to produce crease resistance and some degree of shrinkage control in lightweight cottons, spun rayons, and spun rayon mixtures. During the past 18 years, this finish has become widely accepted, particularly for treatment of spun rayon dress goods and various types of sportswear.

A most important discovery in the research on melamine-formaldehyde resin as applied to wool was that it had the effect of stabilizing the fabric so that it shrank very little. When the Army needed shrink resistant sleeping bag linings during World War II, this new discovery was given a large scale test. Approximately 750,000 yards of sleeping bag lining were treated, with satisfactory results, according to the quartermaster's department.

The first consumer articles treated with the melamine resin process, called Lanaset, appeared on the market just after V-J day, and since that time well over a hundred thousand items—men's and women's sportswear, women's dresses and children's wear—have been sold. Up to the time of this writing, not one consumer complaint has been received. Of course, this quantity is minute compared to the estimated potential market for shrink-resistant garments and yard goods.

The clearest indication that wool shrinkage control is here to stay is probably the recent preliminary hearing

* Textile Resin Application Laboratory, Textile Resin Dept., American Cyanamid Co.

before the Federal Trade Commission, when the National Council of Wool Manufacturers and a number of leading woolen producers joined with American Cyanamid Co., Monsanto Chemical Co., and other chemical companies in requesting that the FTC consider standards and definitions relating to marketing washable wool.

One of the first steps that will probably be taken will be to rule out the word shrinkproof, for it is the opinion of 90% of the trade that no absolutely "shrinkproof" wool fabric can ever be made. To understand the theory behind this, and the way that the resin process controls shrinkage, it is necessary first to understand a few facts about wool shrinkage.

Why wool shrinks

The question as to why wool shrinks has occupied many minds for a long time. One plausible theory is that the inner or cortex part of the wool fiber is elastic in nature, and is normally in an extended state. The cuticle, or surface structure, which is relatively stiff and scaly, holds the fiber in an extended state, in spite of the elasticity of its inner cortex.

When this scaly outer covering is softened by the normal laundering process the elastic cortex causes the fabric to contract. As the fiber contracts, due to its scaly surface, it tends to twist and become entangled and interlocked with other fibers. In this way a dense, hard, matted fabric is produced which is called felt. In the course of this felting shrinkage, as much as 60% shrinkage may take place, and shrinkages of 20 to 40% in each dimension are common after several launderings.

Modification of scaly structure is aim

The various processes for controlling wool shrinkage all aim at modifying the scaly structure of the wool fiber in some way. For instance, the best known chemical reaction process consists of the treatment of the wool with halogens such as chlorine. There is also one which uses alcoholic potash. These treatments modify the tip of each scale structure of the fiber by partial solution, removing from 3 to 5% of the weight of the wool and thus giving a smoother fiber.

On the other hand, the resin treatment is a building process. The resin fills in the hollows or valleys around the tip of the scales and possibly is deposited within the cortex of the fiber, although microscopical evidence of this is difficult to obtain. With a phase microscope it is possible to see the resin distributed along the surface of the fiber. By using mounting mediums of known and varying refractive index, it can be found whether or not this resin is properly cured. No doubt one reason why the resin reduces the shrinkage on washing is that it fills in these hollows, thus making the fiber smoother and less liable to entangle with its neighbors and felt. Another reason may be that the resin does penetrate within the fiber to a certain extent, thus decreasing the elasticity of the cortex which results in fibers that are less easily bent and meshed with one another.

During the last 2 or 3 years most of the larger woolen mills have been carrying on experiments with one or another of the approximately 36 processes now being promoted for shrinkage control of wool. The first evidence of what the findings have been occurred last spring when Pacific Mills, employing a resin treatment marketed as Pacifix, advertised a shrinkage of less than 2% in either dimension after commercial laundering.

The chlorination process has had its greatest success in the treatment of socks and yarn for knit goods. In England, both wet and dry chlorination processes have been employed for quite some time now and good results are reported.

The practical advantage of the chlorination processes seems to be economy, at least for relatively small runs. Mills producing large quantities of goods seem, however, to favor the resin process. This is perhaps because of the problems of controlling the chemical reaction of the chlorine, which has a great affinity for wet wool. Consequently the chemical reaction has to be carefully watched to prevent the fiber from being damaged and to get a uniform treatment. And so, on

Comparison of shrinkage of starch-filled and resin treated curtains after same washings

Phase microscope reveals resin distributed along the surface of a treated wool fiber

Resin treated wool shirts retain size and shape; untreated shirts shrink and "felt"

large runs of woven and jersey knit fabric the economic factors seem to favor the resin process.

It is impossible at present to give accurate comparisons between the different types of finishes or between the results obtained with the same finish on different fabrics. This is because there is as yet no standard test for shrinkage. Actually, there are two kinds of shrinkage—relaxation shrinkage and felting shrinkage. Relaxation shrinkage may occur even when the fibers are absolutely shrinkproof. During the manufacture of woven goods or knitted garments, the yarns are under a certain amount of tension and consequently the finished goods have a tendency to relax. Felting shrinkage has already been described. It is caused by the shrinking and interlocking of the individual fibers. Obviously, relaxation shrinkage may vary greatly, depending not only on how the goods have been woven, but how they have been finished. If they have been pulled out during finishing to a size greater than normal, there will be a considerable amount of relaxation shrinkage taking place as soon as the fabric is wet.

The London-shrink cold water sponging process is used to restore goods to more or less normal relaxed size. But the results are not always the same, nor are the goods completely relaxed in every case.

How resins are used

The application of melamine resins to woven or knitted fabrics is simple enough in principle. A water solution of the proper strength is made up from the crystal clear syrup which contains 80% solids as shipped. This solution is applied to the cloth on a two or three roll mangle operating under closely regulated pressure, preferably hydraulic. The goods are then dried and finally cured for about 5 min. at 300° F. Both from a shrinkage and hand standpoint, this drying and curing should be done with a minimum of tension.

The chemical process which takes place is that of polymerization. In the liquid bath the resin molecules are mostly monomers, or single molecules. During the curing process these monomers are linked together to form polymers. This is roughly analogous to a group of children linking hands. If but two or three children join hands the group retains much of the mobility of the individual. However, as the chain grows in length, and particularly if cross-linkages are made between neighboring chains, the group becomes less and less able to move around. As the degree of chemical polymerization increases, the resin polymers become less and less soluble in water and in other liquids. The insolubility of the completely polymerized resin in water and in hydrocarbons is the basis of their durability and their resistance to laundering and to dry cleaning. In this respect, the melamine derivatives are more resistant than the urea derivatives, inasmuch as they are about as resistant to boiling soap solutions as the urea products are at 160 to 180° F.

Other chemicals employed

The application of Lanaset resin has been described in some detail because the method is typical of the way all of the urea and melamine resins are applied to fabrics in general. Through use of various other chemicals in the resin bath, different qualities are obtainable, making possible a wide range of improvements of value to one or another of the various natural and synthetic fibers. Thus melamine resin in connection with other chemicals can control shrinkage, stabilize a fabric, impart crease resistance, give durable crispness, or produce a washable glazed chintz.

For instance, a melamine resin, now known by the trade name of Sheerset resin, was used during the war to stabilize insect and camouflage nettings. Cotton nettings were thus given shrinkage control, durable crispness, water repellency, and mildew resistance in one bath. Certain cellulosic ethers were also used for this purpose, but only the resin finish was able to treat nylon nettings satisfactorily.

Today the Sheerset resin is being widely used for rayon-nylon and nylon, tulle, and net because de-

signers of dresses, millinery, and theatrical costumes like the crisp hand, and the manufacturer and retailer esteems the fact that this crispness is durable. This durability is easily demonstrated by dipping a treated piece of net or tulle and an untreated in a bowl of water. The ordinary net collapses limply, thread slippage occurs, and the whole character of the fabric is lost. When the resin treated fabric is shaken, the water falls away and the crispness is unimpaired. Pleats may be pressed in such treated fabrics with the certainty that they will not come out on the first humid night the dress is worn. In addition to the use by manufacturers and designers thousands of yards of treated net are being sold over the counter.

A similar finish, Lacet resin, is being applied to Nottingham type lace curtains. Treated curtains may be washed without the former nuisance of having to dry and stretch them on a frame.

The merchandising significance of these resin finishes is that by improving the use and service characteristics of textiles a new and enlarged market has been created. Undoubtedly as the buyers' market returns to the textile industry, mills will use more and more of the new finishes to give them competitive advantages.

Thermoplastics also used

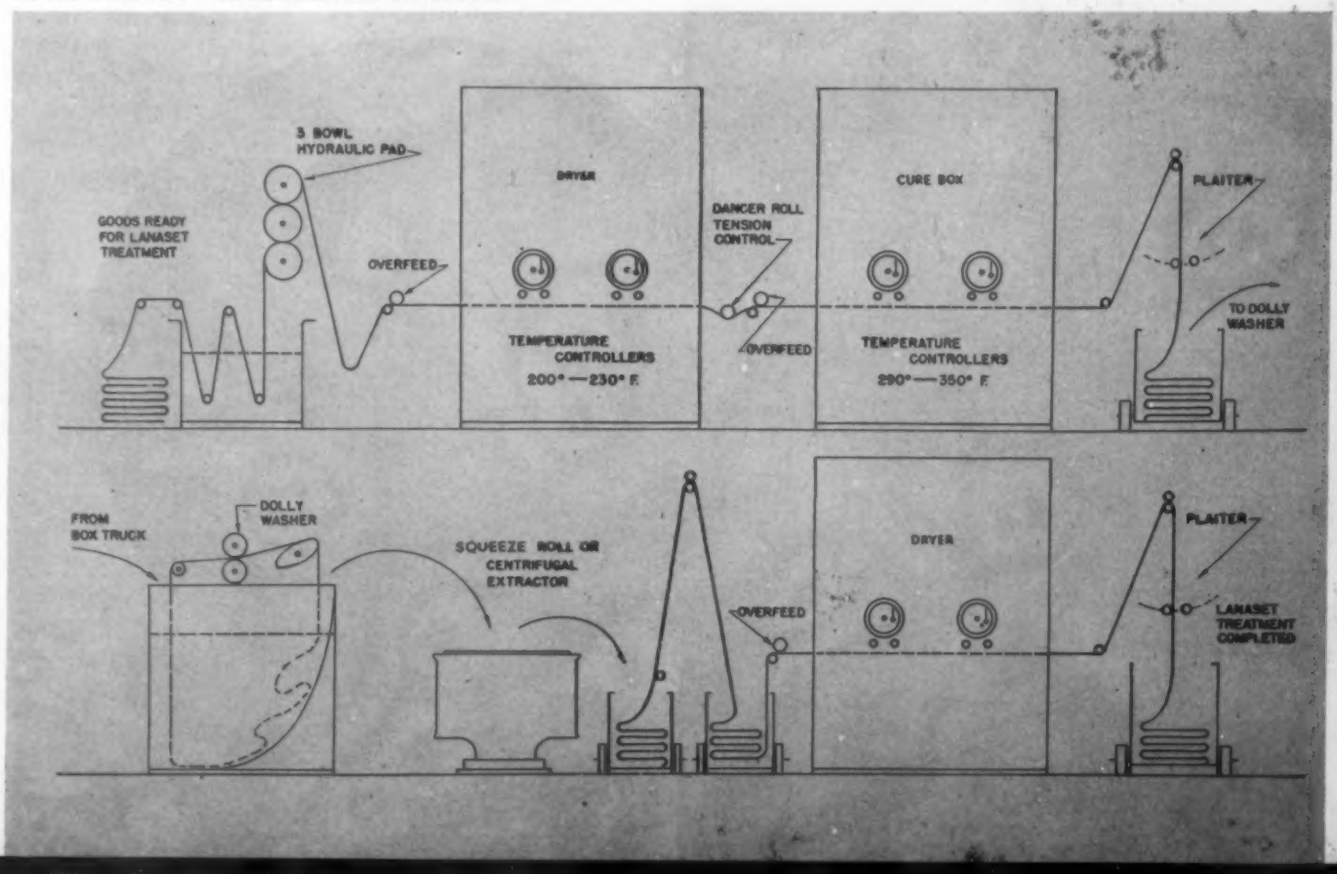
The resins discussed so far are thermosetting, but thermoplastics are also being developed for use in textile finishing. During the war years military demands were such that thermoplastic resins were not available for textiles, so relatively little mill run data are available as yet. To date the main function of thermoplastic treatment has been to give a soft or stiff hand that is wash resistant. The resins also improve drape and increase abrasion resistance, but they generally do not give shrinkage control or crease resistance. Actually, a sharp differentiation between thermosetting and thermoplastic resins cannot be made, since minor changes in handling can make a thermoplastic into a thermosetting resin.

It seems likely that the greatest use of thermoplastic resins will be in conjunction with the thermosetting resins. For example, a new, soon-to-be-announced finish will combine these two types of resins to offer for the first time a satisfactory crease-resistant finish for medium and heavy weight cottons; all previous crease-resistant finishes for cottons have weakened the tensile strength and so have been impractical for general use.

While the emphasis in this article has been put on resin finishes for textiles, it would be unwise to assume that only resin finishes have merit. However, any chemical modification of the fiber has to straddle this difficulty: either the fiber may be damaged through too much chemical reaction or the desired result may not be obtained because of too little reaction. Furthermore, a chemical reaction generally takes something away from the fiber, while a resin finish is additive and leaves the finished cloth slightly heavier after the treatment than before. Like the resin finishes, the chemical ones are usually resistant to washing or dry cleaning and in this respect are a distinct advance over pre-war methods.

Simplified chart of one method of applying a water solution of a resin to woolen cloth for shrinkage control. Solution is in tank at upper left

ALL ILLUSTRATIONS WITH THIS ARTICLE, COURTESY AMERICAN CYANAMID CO.



New tank cleaner features

Complete vacuum cleaner outfit with accessories. Mothomizer jar is at extreme left

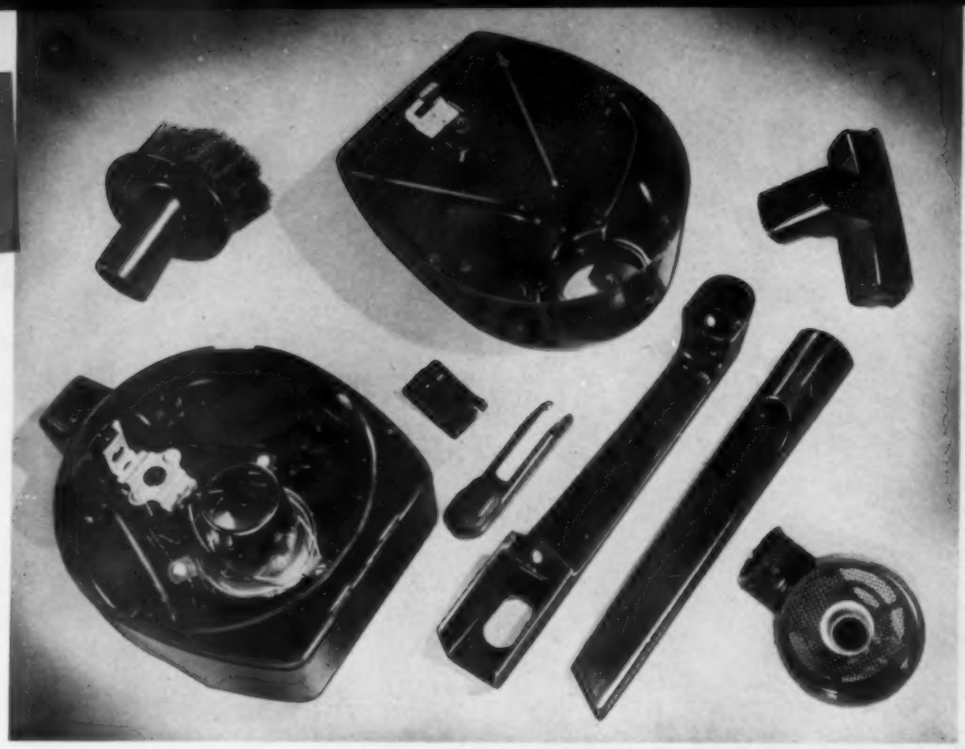
NINE plastic parts are used in a new tank type vacuum cleaner which has many features that will appeal to the housewife. Eight of these parts—end caps, handle parts, round and furniture brush heads, and mothomizer head—are molded of Durez or Bakelite phenolic; the nozzle for cleaning seams and cracks is molded from Celcon ethyl cellulose by Tech-Art Plastics Co., Long Island City, N. Y. The phenolic parts are molded by the Hoover Co., North Canton, Ohio, which recently introduced the cleaner. Henry Dreyfuss styled the unit.

Stooping is virtually eliminated in the use of this new cleaner, and the housewife need never touch the bag or the dirt when emptying the enclosed bag. Because of the angle at which the slot for suction hose is set, the hose can be slid directly into place without stooping. Locking is automatic, but the hose can easily be removed by touching a toe button to release it.

To lift the cleaner upright, either for storage or carrying, it is not necessary to bend over; the hose is used to pull it up to position. A convenient carrying handle is

Suction end of cleaner tank. Slot for suction hose is placed at a convenient angle

Skids under tank are set at angles to wipe out track marks as they slide over carpet



Plastic parts of the new vacuum cleaner are shown at right. The nozzle is molded of ethyl cellulose; the other parts of phenolic

Below—Slight pressure elevates the furniture brush bristles to desired position

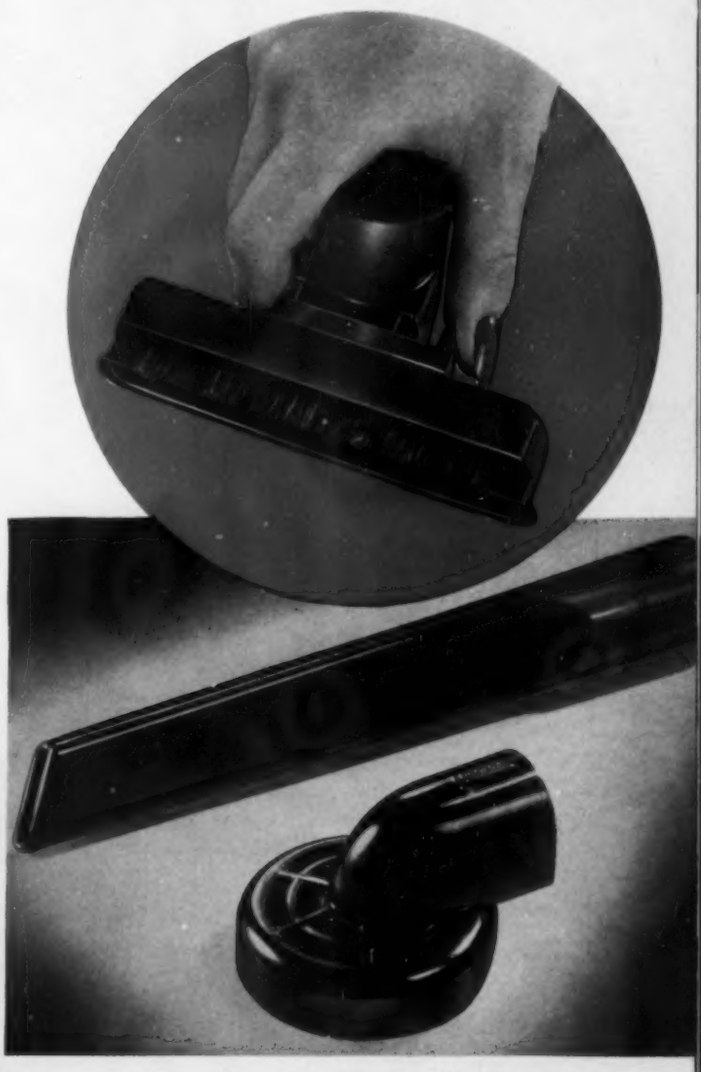
located on the end cap, and another on the side of the tank for horizontal carrying. The power switch and the levers which operate the dirt ejection system can all be toe operated.

Engineered for strength

Both the suction and blower end covers of the tank are designed with a minimum of inserts and are engineered with integral bosses for added strength. The furniture brush has a slotted lever arrangement for raising or lowering the bristle unit, and the round brush has a center tube of soft synthetic rubber to prevent scratching finely finished surfaces.

When the cleaner is to be emptied, the suction end cap is released by stepping on a treadle. The tank is then turned up on end on a newspaper. Stepping on lever shakes the dirt loose from the internal bag and the emptying job is finished.

Bristles and center rubber tube of round cleaning brush are set in a phenolic cap



Slim nozzle is molded of ethyl cellulose; mothomizer cap (at bottom) is of phenolic

Resin-impregnated wood veneers are adaptable to soda fountain and other counter tops

Plastic protected wood veneers

A laminate incorporating a sheet of melamine-impregnated veneer makes wear and stain resistant table and bar tops

WHENEVER IT is desirable to take full advantage of the warm beauty of wood—its grain, coloring, optical depth, etc.—melamine resin can add to a wood veneer surface a highly desirable hardness and resistance to wear and chemical attack. A few of the present applications of one form of resin-protected wood, called Realwood by the Formica Insulation Co., Cincinnati, Ohio, are shown here. Because the Realwood surface is protected by a clear colorless film of plastic which it is virtually impossible to stain, the laminated material is finding increasing uses for table, counter, and bar tops as well as for wall covering.

A sheet of Realwood consists of a core, a binding sheet, a layer of actual wood veneer, and a top sheet of paper impregnated with melamine so that it is perfectly transparent and so that the resin itself becomes the surface of the sheet. Before laminating, the veneer sheet is resin treated and the entire sheet is then cured at a temperature of 300° F. under a pressure which sometimes exceeds 2000 p.s.i. The finished laminate, when it is to be used for a table top or similar surface, is glued over a backing of plywood which has a close-grained face.

In general, most of the woods which are desirable because of grain beauty and color can be adapted to this use. Present limitations appear to be only where large discontinuities of the wood grain are present, as in the case of crotch wood and the like. Lower pressures and higher curing temperatures can be used with woods which might crush under high pressure.

Appeal of wood

Aside from the fact that Realwood surfaces resist alcohol, cigarette burns, and the roughest use to which a counter or table top would be subjected, the Formica

company places emphasis on the eye-appeal of the wood itself. The public is used to seeing and feeling wood; there is an appeal offered by wood which promotes a feeling of comfort in surroundings and inspires respect on the part of users.

For all these reasons, plus the fact that the protected veneer surface can easily be cleaned with soap and water or by other conventional means, first main uses of Realwood have been in public places—hotels, bars, restaurants, and the like.

On the horizon, Formica sees an extension of these uses into the home. For table tops of all kinds, especially coffee and cocktail tables and smoking stands, the variety of available veneers can be fitted into any decorative scheme. On Milady's dressing table, for example, a top can be used which will blend or contrast with the rest of the furnishings. And when a drop of perfume is spilled accidentally, it can be readily wiped off without damaging or dulling the finish.

Retail stores find new color scheme possibilities with veneer covered display counters

Richness of wood protected by plastic lends charm and wear-resistance to hotel bedrooms

ALL 4-COLOR ILLUSTRATIONS, COURTESY FORMICA INSULATION CO.

The Miracle

PHOTO, COURTESY MUSEUM OF SCIENCE AND INDUSTRY

Feature of the Chicago exhibit is this acrylic figure of pregnant woman with cast acrylic fetus

RECENTLY opened at the Museum of Science and Industry in Chicago is a comprehensive new exhibit called The Miracle of Growth, which may well serve as a future guide post in the field of medical education. The presentation is of special interest to the plastics industry because it proves that creators of medical teaching aids now have, in properly chosen plastic materials, a powerful ally whose value is limited only by their own imagination.

Anatomy of pregnancy

Planned and prepared in the Chicago Professional Colleges of the University of Illinois, The Miracle of Growth exhibit traces the development of the individual from conception through the pre-natal period, birth, infancy, childhood, and on into adult life. Several of the most dramatic parts of the exhibit, graphically depicting the anatomy of pregnancy and different stages in the growth of the human embryo, are of carved, cast, or molded acrylic material.

All of the new teaching aids are the outgrowth of extensive development and fabrication work by the Illustration Studios of the University of Illinois College of Medicine and Dentistry, Chicago. Individuals most closely identified with the actual design and fabrication of the exhibits are Ruth B. Coleman, associate in medical illustration, and Coleman Hewitt, who conducted the necessary research in plastic technique. The department is under the direction of Tom Jones.

First step in forming a section of the transparent woman is placing acrylic sheet over the mold. This 0.080 sheet has been preheated to about 300° F. in a special oven fitted with infrared lamps

A seal ring is then locked into place. Early attempts to mold sheets by direct attachment to vacuum source failed as the material cooled too rapidly. A vacuum accumulator proved successful

# of Growth

Transparent acrylic models present educational details dramatically. Further development along similar lines holds promise of expanding use of visual aids for medical education

Central figure in The Miracle of Growth exhibit is a transparent woman, slightly more than life size, designed to symbolize the anatomy of pregnancy. The transparent sheet Plexiglas figure contains an intricately carved and formed pelvis of the same material and a cast acrylic fetus within a transparent uterine sac, in the position normally preceding delivery. Through light piped from a concealed lamp in the base, the plastic fetus glows softly.

Fabrication of this key figure with relatively simple, improvised equipment is a tribute to the ingenuity of its makers. After close study of anatomical and obstetrical relations, sketches were prepared and a massive clay figure, supported by an armature of pipe, wood, and heavy wire, was constructed. Care was taken to make the model sharper of contour, particu-

PHOTO, COURTESY MUSEUM OF SCIENCE AND INDUSTRY

Thirteen formed sections make up this figure, illuminated by light piped from pedestal below

As soon as the operator opens valve to release vacuum, the preheated sheet is drawn down into the mold and shaped before cooling can occur. A manometer registers degree of vacuum present

Here, an operator removes the formed piece from the mold. Each section is made to overlap the adjacent mold, thereby affording ample surface in the synthesis of the completed model seams

ALL PHOTOS ON PAGES 114 AND 115, COURTESY UNIVERSITY OF ILLINOIS ILLUSTRATION STUDIOS

Before forming, acrylic sheets and other parts are heated in this specially constructed oven

Pelvis and thigh bones for the transparent woman were formed and carved from solid acrylic sheet

larly in the face, than the desired finished plastic form, since it was recognized that the formed acrylic would carry a softer contour than the original pattern. Following completion of an oil clay model, the figure was cast by a piece molding process in plaster of Paris and a solid reproduction of the clay model was poured of dental stone. When tooled and finished, this figure became the master pattern from which all molds were made for parts forming the shell of the final figure.

Thirteen negative molds of Coecal* and hydrocal were required to encompass the figure, each so made that it overlapped the adjacent mold to afford ample surface for seams in the synthesis of the finished model. Each mold was set into a rectangular plaster block which would resist mechanical strains.

Vacuum forming

After a review of available forming methods, it was decided to shape the component Plexiglas sections by means of the following technique:

Into the bottom of each mold, one or more lengths of brass tubing furnish connections to the vacuum source for evacuation of the mold. The essential elements for this work comprise an aspirator, a manometer, vacuum accumulating reservoirs, the mold outlets for attachment of the vacuum lines, a valve controlling the vacuum, and a seal ring device on top of the mold, with a lever arrangement designed to hold it clamped tightly in position. The 0.080-in. Plexiglas sheets were heated to a temperature of about 300° F. by means of a bank of infrared lamps in a specially constructed oven.

Vacuum for the forming process is created by means of an aspirator attached to a water faucet and accumulated in three tightly sealed metal drums. The manometer in the vacuum circuit registers the degree of vacuum present.

In the actual molding, the heated sheets are removed from the oven and placed immediately over the mold which has been coated with Vaseline or cup grease to prevent excessive "mark-off." As soon as the seal ring has been locked in position, the vacuum is released drawing the sheet down into the cavity where it is held until cooling has taken place.

Assembly methods

After forming of the 13 basic sections, the pieces were trimmed and hand fitted for assembly. Caliper measurements from the master plaster figure were used as a final check for accuracy in fitting. Sections were then joined with chloroform applied at the joints with a hypodermic syringe and any crevices remaining were filled with thick cement prepared by dissolving scrap Plexiglas in methylene dichloride. Polished and buffed, the completed acrylic shell was then ready for insertion of the fetus, pelvis, and uterus.

The pelvis was formed and carved from sheet acrylic, as were also the two femurs (thigh bones). The fetus, cast by a process described below, is finished with a frosted surface which causes it to glow when light is piped into it.

The rod which transmits light into the body of the baby and also supports it within the figure of the mother is a clear length of Plexiglas $1^1/_2$ in. in diameter, encased within a metal sleeve. The uterus, highly simplified, is a two-piece shell of thin acrylic.

The full-term fetus, as well as a series of others appearing elsewhere in the exhibit, was cast of methyl methacrylate monomer, procured in its uninhibited form from Peters Chemical Co., Melrose Park, Ill.

Casting embryos

Following is a description of the procedure employed in casting the acrylic embryos in a three-section mold:

Prior to casting, the liquid monomer is filtered to remove impurities and benzoyl peroxide is added as a catalyst—approximately one slightly rounded teaspoonful to 500 cc. of monomer. Partial polymerization is ac-

* Coe Laboratories, Chicago, Illinois.

Upon removal from the plaster mold in which it is cast, the full term acrylic fetus is tooled, then polished with usual buffing techniques

Careful attention to detail is apparent in the finished fetus

complished by heating the monomer with dissolved catalyst in a flask over a water bath held at approximately 177 to 181° F. The flask is agitated at intervals of 1 to 3 min. and the cork removed at similar intervals until the material assumes the consistency of glycerin.

The pre-polymerized plastic is poured into the plaster molds in layers approximately 3/8 in. thick. Bubbles formed in pouring are removed with a sharp instrument. The plastic is then cured in an oven at 110° F. until quite hard. In the embryo models, the hardening process required 24 to 36 hr. per layer.

After the mold has been entirely filled with hardened plastic, it is removed from the oven and the plaster is broken away. The cast embryo is then tooled and polished.

Other medical models

Although the central figure of the pregnant woman and the cast acrylic fetuses represent the major plastic applications in the growth exhibit, a number of other models indicate the wide possibilities of transparent plastic materials as medical teaching aids.

In one section of the growth exhibit, devoted to the story of the teeth, is a greatly enlarged (33 to 1) model of a baby's front tooth. Another model of interest is a transparent head with skull, showing the cranial nerves as they emerge from the bony foramina. For this exhibit, a clay model was built up over a plaster cast of an actual skull and negative molds were made from this model for vacuum forming by the technique previously described. The plastic shell was fitted over the actual skull and the completed model mounted so it could be moved into various positions for study.

Marked with wax pencil

Differing in approach, but also valuable as a teaching aid, is the acrylic box housing a plaster model of the human brain. Here projections of the brain outline, ventricular system, skull outlines, and outlines of the face and head are etched on the inner side of the perpendicular surfaces of the box, leaving the outer surface clear for wax pencil diagramming by the instructor. Such marks can be erased with a soft cloth and new ones added as desired.

Writing of the educational significance of this work in a recent issue of *The Journal of the Association of American Medical Colleges*, Miss Coleman and Mr. Jones stated:

"These are only the beginning. Given an understanding of the principle of the clear view model—its potentialities and its limitations—as a visual aid, unlimited particular models of great usefulness suggest themselves."

Insertion of plaster brain in outlined acrylic box allows instructor to mark key points

ALL PHOTOS, COURTESY ACF-BRILL MOTORS CO.

Plastics in post-war buses

LIKE the manufacturers of passenger automobiles, makers of buses and coaches are turning to plastics for a wider variety of applications since these materials are proving themselves in use. The average life of a big motor coach is 10 years—although there are many on the road today with a record of much longer service—and in a 10-year period many buses travel 2,000,000 miles. The increased use of plastics in buses under such strenuous use is a tribute to their worthiness.

Being lighter in relation to strength than other materials, plastics permit doors to be made wider, thus speeding up schedules. Plastic surfaces require no finishing or refinishing, thus cutting maintenance costs. And parts can be made shatter-proof when plastics are employed, thus adding to the safety factor. These are just three of the tangible results accruing from the use of plastics that lie at the bottom of the decision of ACF-Brill Motors Co., Philadelphia 42, Pa., to use an increasing number of plastic applications in the 4600 and more new buses for which it now has orders. Its new 37-passenger intercity coaches, the 36-passenger urban buses and trackless trolley coaches incorporate new engineering developments all involving use of plastic.

The first thing you see as an ACF-Brill bus ap-

proaches is an acrylic destination sign across the front. This sign is curved slightly to fit in with the streamlining of the body. This curvature would make glass too expensive, so a flat piece of acrylic, $^{5}/_{32}$ in. thick, is used for glazing this sign. The piece is put in by means of a special glazing rubber gasket made by Inland Mfg. Div. of General Motors Corp., 2727 Inland Ave., Dayton, Ohio, and falls into the curved shape so that it is vibrationless when installed and yet may be easily removed. Keystone Plastics Co., Swarthmore, Pa., fabricates sign.

In the city buses, a switch was made from the pre-war steel doors, both front and center, to plywood doors. Acrylic glazing, also processed by Keystone Plastics Co., is used in these doors to match the resilience of the wood. The acrylic is $^{1}/_{8}$ in. thick, is gasketed into position and, after many months and miles of use in test buses, shows almost no deterioration through abrasion.

Intercity buses

On the intercity model there is an emergency equipment box just inside the door. The front panel of this box had to be light in weight yet non-splintering when smashed. So acrylic was used again, riveted to a metal frame. Another use of acrylic is in the Lucite target signs on the back of the intercity buses, dramatically featuring the name and trademark of the transportation company. These signs are made of laminated acrylic pieces by Walter S. Oppenheimer & Sons of Philadelphia, Pa.

Acrylic is used also in the translucent, formed light band down the center of each coach, shielding either fluorescent or incandescent lighting units. There are two different styles in these fixtures. Both are formed by Keystone Plastics Co. from $^{3}/_{32}$-in. thick translucent Plexiglas and attached by screws to metal hangers. The reflectors for the buses—amber in front and red in the rear—are yet another plastic lighting application. Molded of polystyrene, these reflectors are supplied as units by K D Lamp Corp., Cincinnati, Ohio.

On each side of the emergency door in the intercity coach is a red light which glows. This is made from a $^{9}/_{16}$-in. round bar of clear Plexiglas, sawed in half and backed with a piece of red Plastacele so that the rod glows red when the edge is lighted. The whole unit is the product of both Plexity Products Co. of Ardmore, Pa., and Walter S. Oppenheimer & Sons.

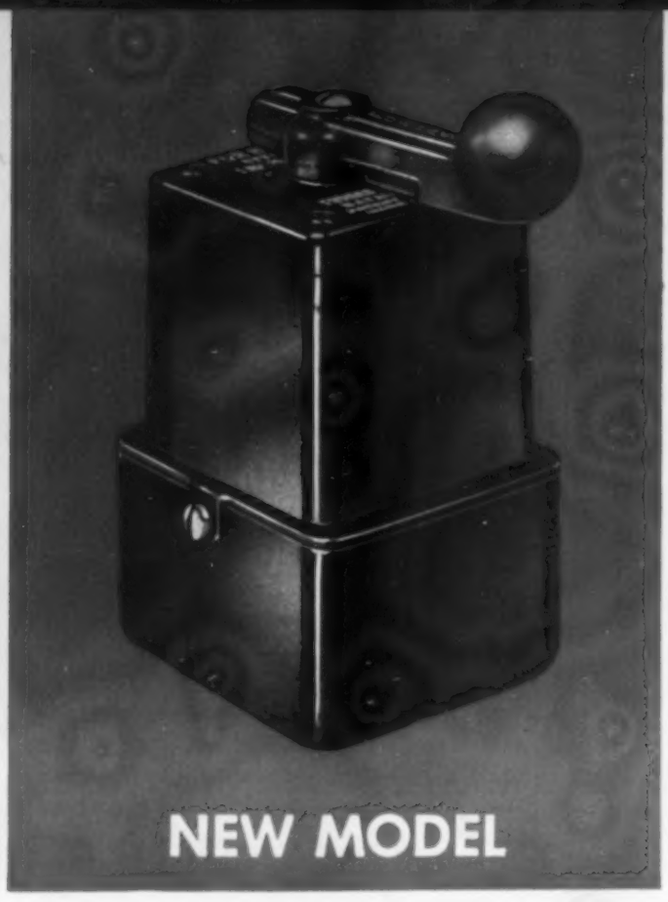
Panels of phenolic surfaced plywood

Phenolic surfaced plywood molded by Frank C. Snedaker & Co., Inc., 9th and Tioga Streets, Philadelphia, is standard on the intercity coaches as curved top panelling above the windows and as side trim panels below the windows. Formica has also been used below the windows in some buses.

Across each reclining seat on the intercity coaches is a vinyl towel rack holder extruded by Irvington Varnish & Insulator Co., Irvington, N. J. Other uses of vinyl are the Koroseal seating and the window shades made by Pantasote Corp. of Trenton, N. J., and Western Shade Cloth Co., 122nd and Jefferson, Chicago, Ill.

The drivers of these buses are surrounded by plastics in various forms. Engraving-stock, high pressure laminate switch panels, fabricated by Walter S. Oppenheimer & Sons, are used as are laminated Textolite switch panels made by Willson Plastics Div. of Willson Magazine Camera Co., 6022 Media St., Philadelphia, Pa., and printed white on black. The phenolic portions of these switches and the red knobs on the gears and levers are molded by Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago, Ill.

Less obvious applications of plastics are the air conditioning insulation tubes made by Synthane Corp. of Oaks, Pa., and phenolic laminate motor parts which are seen only by maintenance men. Consideration is being given to the use of a high pressure decorative laminate for perforated ceiling panelling in air conditioned coaches in place of aluminum. The advantage in this application would be saving in weight and maintenance.



ALL PHOTOS, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

1—In original switch, the cover was of drawn steel. Separate assembly operations were required for the stops and for insulation on inside of cover

2—With the bottom of the main body an integral part of the case, the need for a separate insulating material was eliminated in redesigned switch

Redesigned motor switch produced more economically in plastic

A BETTER product with a 20% reduction in cost, additional uses, cleaner lines—these are some of the qualities obtained by the Furnas Electric Co., Batavia, Ill., when it made use of phenolic in redesigning its l-hp. motor reversing switch.

The original reversing switch had a cover of drawn steel (Fig. 1), a difficult and expensive cover to make. The switch lever stops were of metal located on the outside of the cover, thus entailing a separate assembly operation. The two-part body of the switch was of phenolic, the switch knob of metal. Another assembly operation was required to insulate the cover.

Last year, when Furnas engineers decided upon a changeover they did not simply design a molded cover. Instead, by a slight change in design of the interior mechanism, it became possible to mold the case integrally with the stationary contact mount (Fig. 2), which is the lower half of the main body. Because the Durez phenolic used is self-insulating, the need for a separate insulating material is eliminated.

Four plastic parts

The parts required for the redesigned switch and a completed switch are shown in Fig. 3. The knob or switch lever is molded of red phenolic; the other three molded parts are of black. The metal contact points in the top half of the switch mechanism are molded integrally. In the new switch, the lever stops formerly outside the cover are now inside and part of the cover itself. All-through holes and blind holes required for assembly are molded in.

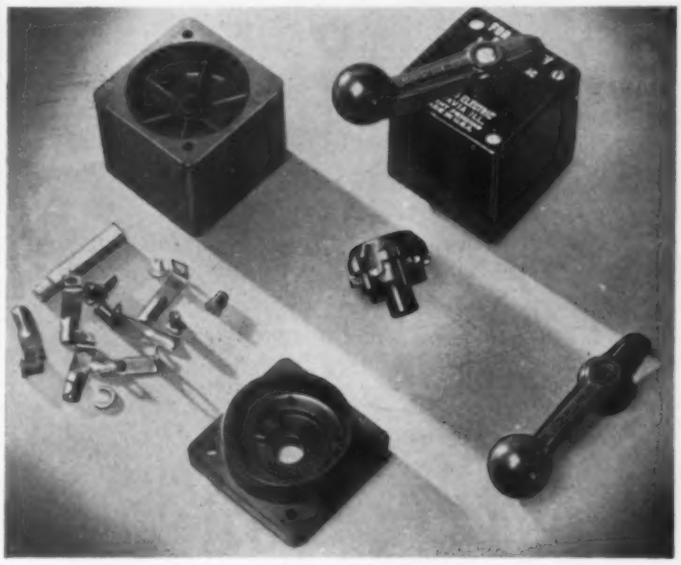
The company name and other data are molded into the cover (Fig. 4), giving permanent, non-removable identification. This recessed lettering has a white enamel wipe-in for contrast against the glossy black, and for quick and easy readability.

Because of lower manufacturing costs, the company is able to offer this switch at the same price at which the old switch sold in 1936, a 20% saving.

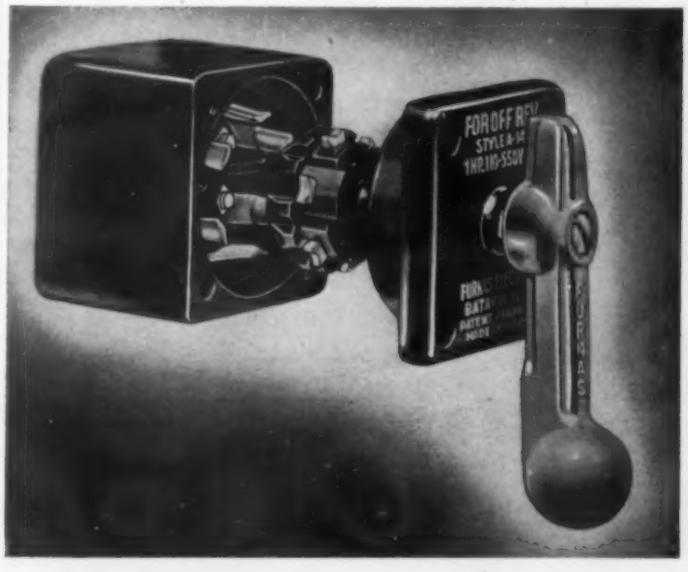
Four modifications

While the old switch was used only for reversing service, the new one is furnished in several different switching arrangements. In addition to reversing, there are four modifications: 1) three-phase off-on duty, 2) two-speed, double winding motors, 3) series-parallel connections with maintained polarity, 4) use as a double-pole, double-throw switch.

3—Parts required for the new switch are shown below. The knob is molded of red phenolic; the other three molded parts are of black phenolic



4—Lever stops are eliminated from the outside of the new switch, improving appearance. Recessed lettering has white enamel wiped in



Stereo viewer

has plastic case and light control button

STEREOSCOPIC pictures, one of the country's favorite indoor sports early in the century, went out with high button shoes. But, like the dresses of the same period, the stereoscope is coming back—in plastics.

The stereoscope is back because amateurs can now take their own three-dimensional pictures with the Stereo Realist camera, developed and manufactured by the David White Co., 315 W. Court St., Milwaukee 12, Wis. The cast aluminum chassis of the twin-lens camera is covered with Vinylite plastic for better appearance and feel. A phenolic cover protects the lenses.

Viewer made of phenolic, urea

Black general purpose phenolic is used for all plastic parts of the viewer except the focusing knob and the light button, which are urea. The parts are molded by Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.

Two flashlight batteries furnish current to a single bulb which illuminates the pictures. Clarity of image is assured by achromatic lenses which can be adjusted to the distance between the user's eyes.

The Realist camera uses 35-mm. color film and takes two pictures at once. The transparencies are then mounted on a slide to go into the viewer. The White Co. will do the mounting for a nominal charge or camera owners can do it themselves with a specially designed jig to assure proper alignment and spacing.

The latest design in refrigerator bowl covers combines rigid Vinylite plastic sheets and cellophane. The pattern of holes makes the bands adjustable to different bowl diameters to give an air-tight seal. The cost is low enough so that covers can be disposed of and replaced every few days. The covers themselves are odorless. Three Fastops and 24 cellophane covers are in each package. Manufactured by Fastop Sales Corp., 60 E. 42nd St., New York City

PLASTICS

Cellulose proprionate is used to mold the tray, pen stand, and inkwell of this Desking set. The Auto-flow inkwell is designed so that the ink will not spill if it is tipped over, and the use of Forticel eliminates the danger of breakage. All parts have a walnut woodgrained effect and a high surface luster which is unaffected by handling or by contact with the chemicals in ink. The set was molded by Sterling Plastics Co., 1140 Commerce Ave., Union, N. J.

In place of the usual miniature felt hats which accompany gift certificates, this phenolic miniature has been adopted by the Byer-Rolnick Co., Garland, Texas. The plastic hat, an exact copy of the company's Resistol Western hat, has reuse value as an individual ash tray. The hat is molded by Accurate Molding Corp., 35-20 48th Ave., Long Island City, N. Y. The acetate box is manufactured and printed by the Texas Paper Box Co., Dallas, Texas

Three cellulose acetate parts and two transparent polystyrene bowls make up this Multisift flour sifter. With the two bowls in place, flour can be sifted back and forth as many times as the recipe calls for by merely turning the sifter over. The transparent bowls are also calibrated for accurate measurement of the flour. Na-Mac Products Corp., 1027 N. Seward St., Los Angeles, Calif., molds the plastic parts of the sifter using Styron and Tenite

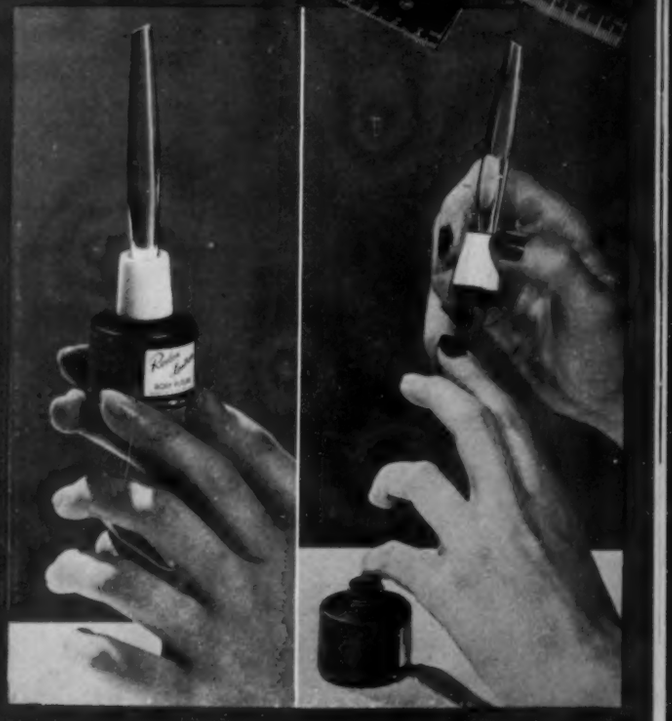
PRODUCTS

An out-of-the-ordinary premium item is this set of transparent polystyrene poker chips which can be made to display advertising copy on one or both sides. A standard chip is available without advertising; it shows poker hands, arranged according to value. Michigan Molded Plastics, Inc., Dexter, Mich., molds the two-piece chips and the cellulose acetate case (which holds 200 chips) for Plastel's Graphic Poker Chip, 126 N. Erie St., Toledo 2, Ohio

Cellulose nitrate sheets are used to fabricate this Pocket Pal drafting template for draftsmen, engineers, and architects. Because this is a precision unit, all templates are individually milled on pantograph machines instead of being die stamped. The printing is on the negative side of the template to prevent it from wearing off with normal handling. Manufactured by Rapidesign, Inc., P. O. Box 592, Glendale, Calif., using Pyralin and Celluloid

The lowly ruler takes on new color and beauty when it is molded of shiny black, bright red, blue, or green polystyrene. The numbers and calibration marks (English scale on one edge and metric on the other) are molded in and a white paint wiped on. Both sharply bevelled edges can be used to rule lines in pen and ink; thus the metal inserts used in wooden rulers are unnecessary. Molded by Northeastern Plastics, Inc., 588 Commonwealth, Boston 15, Mass.

An acrylic plume which screws into the urea closure adds eye appeal to this nail polish container and serves as a convenient handle. The Revlon Products Corp., 745 Fifth Ave., New York City, placed an initial order of 7,000,000 units before introducing its new Lastron polish and the container designed specially for it. The acrylic pieces were molded by Hardy Plastics & Chemical Corp., 1 Junius St., Brooklyn 12, N. Y.; and Arnold Brilhart Ltd., Old Country Road, Mineola, N. Y. The urea closure order was split among: Armstrong Cork Co., Liberty St., Lancaster, Pa.; Owens-Illinois Glass Co., Ohio Bldg., Toledo 1, Ohio; and Victor Metal Products Corp., 196 Diamond St., Brooklyn 22, N. Y.

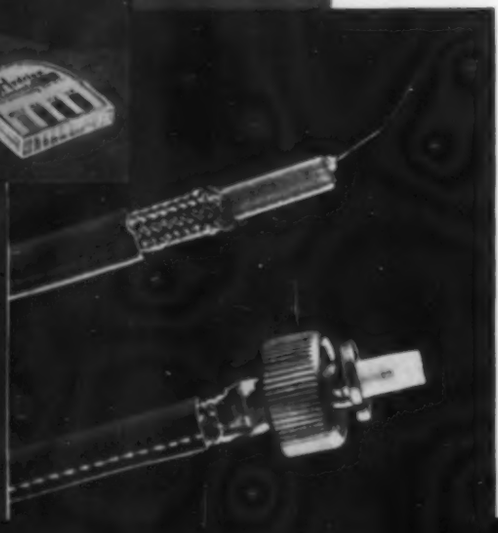


Wartime shortages of rubber in Switzerland led to the development of this atomizer now being produced of urea in this country by the Xpray Corp., 280 Madison Ave., New York City. The rigid construction makes it possible to hold the bottle and work the atomizer with one hand. Because urea resists the alcohol and aliphatic esters found in perfume, the atomizer pump will not deteriorate as will a rubber bulb. Two oz. (left) and 4 oz. sizes are available

PLASTICS

A woman does not risk getting housemaid's knee when she uses this Lin-X Floor Waxer. When the mop handle is tilted forward, a spring-loaded valve touches the floor, releasing a puddle of wax from the inverted bottle. The valve closes automatically when the handle is moved back. The Sherwin-Williams Co., 101 Prospect Ave., Cleveland, Ohio, makes the waxer and the Parker Appliance Co., Cleveland, molds the applicator of Tenite II (cellulose acetate butyrate)

Nineteen pH test papers, covering the full range from pH 0.0 to pH 14.0, are conveniently packaged in 18 transparent polystyrene dispensers in this new Hydrion set made by R. P. Cargille, 118 Liberty St., New York City. Polystyrene was chosen for its transparency and for its ability to resist the dyes which are used in the manufacturing of these special test papers. The plastic dispensers are injection molded by Injection Molding Corp., 115 Fourth Ave., New York City



Automobile radio antenna insulation must be capable of withstanding year-round exposure to weather as well as the abrasive action of road materials thrown up by the wheels of the car. This lead-in wire does the job by making effective use of two plastics. The wire is insulated with polyethylene and the whole wiring unit is encased in a Vinylite jacket. Made by Ward Products Corp., Cleveland, Ohio

PRODUCTS

Opening a hot boiled egg is simple if you can hold the egg without burning your fingers. You can do it with this new Humpty-Dumpty egg holder manufactured by the Moore Push-Pin Co., Philadelphia, Pa. When the egg is slipped into the flexible loop, it can be held firmly while the end is sliced off and contents removed. The front frame of the holder is metal and the loop is extruded vinyl. The Goodrich Rubber Co. supplies Koroseal for the loop

Groping in the dark for the switch is eliminated by this cellulose acetate and polystyrene bedside lamp. Tilting the shade of the lamp turns either or both of the 7-watt bulbs on or off, and the shade automatically returns to a horizontal position. The lamp shade and base are cellulose acetate. The base cover and parts of the hidden switch mechanism are molded of polystyrene. The lamp is made by Hungerford Plastics Corp., Murray Hill, N. J.

Designed primarily to fill the needs of hotels and restaurants, this line of Melmac tableware consists of eight types of plates (including a compartmented grille plate), cups, bouillon cups, and salad bowls. Specially designed "feet" make for easier stacking, keep plates from sticking together, and allow better ventilation and drying while the dishes are stacked. The line is made in three solid colors by Plastics Manufacturing Co., 825 Trunk Ave., Dallas, Texas

Polystyrene and phenolic are used extensively in the electric meters made by Assembly Products Inc., Chagrin Falls, Ohio. One of the meters, only 1 in. in diameter, has case, back, and sub-base molded of polystyrene by Newburgh Machine Engineering Co., 437 E. 106th St., Cleveland, Ohio. The large meter has a phenolic back and a polystyrene front for piping light, both molded by the Richardson Co., 27th & Lake Sts., Melrose Park, Ill.

White opaque insert in cast phenolic handle of flatware adds variety to pattern, also hides metal piece which extends into handle. Individual handles are cut from long cast phenolic rod

Plastics merchandise cutlery

Variety of color and design, a low cost yet high quality product and ease of manufacture were factors attracting one company to plastics

MANY businesses are today discovering that the making of a superior product is not of itself a guarantee that the product will sell. Stiffened competition and the whims of the consumer make it increasingly necessary for companies to use outstanding and unique methods of selling in order to beat competition and attract the customer's eye. In other words, companies must merchandise to sell.

Englishtown Cutlery, Ltd., New York City, which markets a full line of cutlery and table flatware, the bulk of which employs cast phenolic and acrylic handles, is one of the firms that has reaped real gains through merchandising. How the use of plastics can back up an imaginative and aggressive merchandising program is also well exemplified by the work of this company. Low cost, quality, long wear, and variety of color and design are the main features of their selling plan—all points in which plastics have had a great share. On the production side of the picture, plastics offer sturdy materials that will withstand assembly with various metals, and are easy and economical to manufacture.

Among the popular lines made by this manufacturer are tableware sets with bright-colored cast phenolic handles which lend themselves particularly to kitchen, dinette, and outdoor use. Because these sets are sturdy, easy to take care of, and inexpensive to buy, they have become practically a necessity in many a home. Their chief duty is to take much of the wear and care from the family silverware which must be handled more carefully.

Patterns for kitchen tableware

One of the steps in varying the tableware led to the use of clear with opaque colors in the plastic handles. And then it was decided to go even further and incorporate designs in the utensil handles—much the same as is done with silverware—except that the designs, of necessity, had to be simpler. The company's Townley pattern is a successful result of this experimentation. This flatware has a clear cast phenolic handle with a white opaque flame-shaped insert in the upper half. The flame not only decorates the piece but, being opaque, serves the added duty of hiding the metal tang which extends down into the handle.

Personalizing tableware

One of the newest and most successful means of merchandising the Englishtown plastic-handled tableware

is accomplished through monogramming. By supplying stores with a quick and simple-to-operate monogramming machine the manufacturer makes it possible for a customer to purchase a set of flatware, have each piece initialed free of charge in a desired color, and walk out with it in a few minutes' time.

Stores are urged to do the monogramming on the floor as a crowd-getting stimulant. The manufacturer also points out that initialled cutlery creates permanent sales, eliminating returns and refunds.

The monogramming machine is supplied with a set of alphabets and five colored paste pencils—black, red, white, yellow, green, and blue. After the initial has been cut by a modified pantograph the color pencil is applied to the cut-out area. When the paste dries the initialing is complete and remains waterproof and wearproof throughout use.

Matching cutlery to china

Because plastic-handled cutlery is used largely in the kitchen, dinette, or for outings, bright colors have always been favored. However, the manufacturer discovered that pastel shades would sell in the summer months and therefore decided to stimulate such sales. This was done by matching the colors of the cutlery to the colors used in Luray china. And just as Luray china has four different colors in each set, so the plastic tableware set utilizes four different colors—green for the knives, yellow for the forks, blue for the tablespoons, and pink for the teaspoons.

Place settings combining the china and the cutlery have been assembled by stores handling both items and put on display. The resulting sales have been most heartening.

Tableware having molded Lucite handles represents a step by the manufacturer to "trade-up" the plasticware from the kitchen to the dining room. The higher price range immediately suggests to the customer that this line can be used for something more than "everyday use." The conservative design and the fact that the handles are made in black and clear, rather than in bright colors, also gives a suggestion of formality.

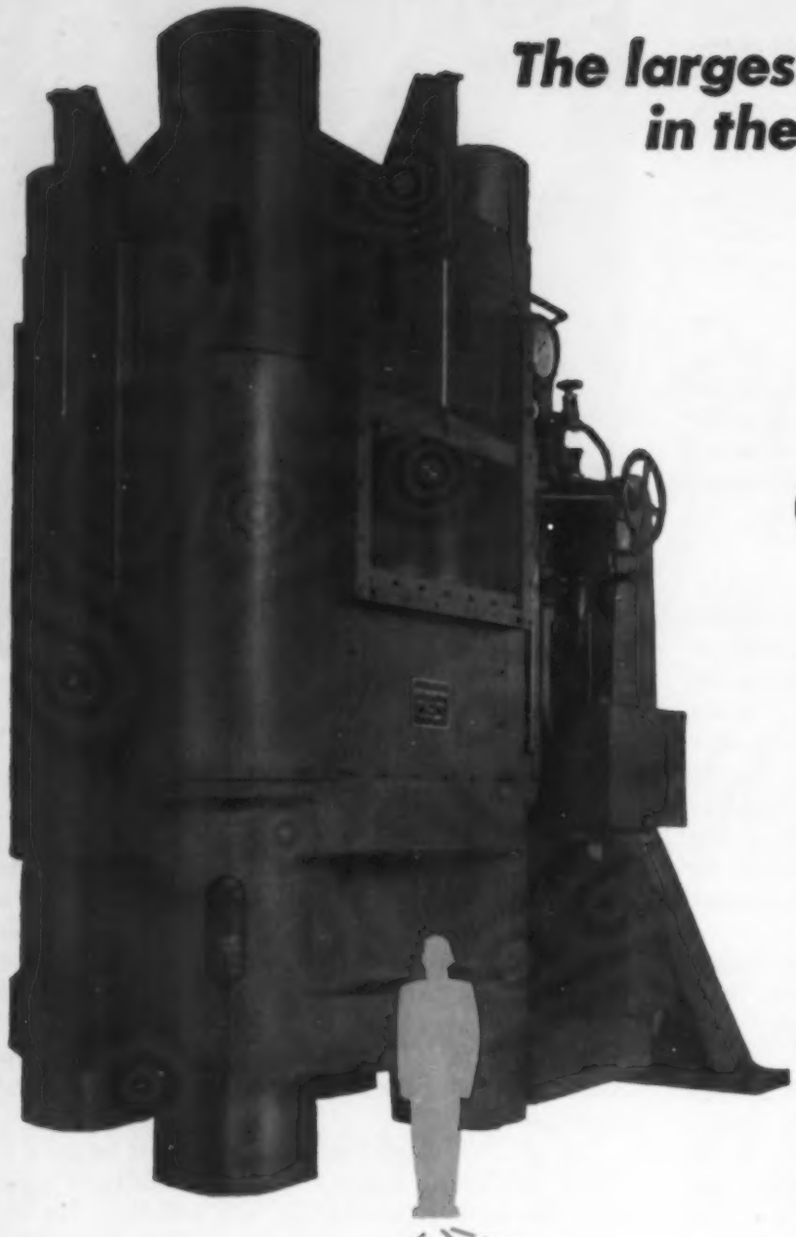
The casting of the flame-shaped pattern handles, actually one of the most complex designs, involves only a few simple operations. The manufacturer obtains materials from Catalin Corp. and Marblette Corp. who also cast the handles to specifications. The white flame-shaped pattern is cast first in the form of a long bar. Next the red phenolic is cast around this bar to make another bar whose cross section is the shape of of the handle. After cooling, the bar is sliced into a number of pieces, each of which makes one handle. The manufacturer then takes over, drilling holes for the tangs, assembling the metal utensils to the handles and finally polishing.

The phenolic carving set handles are cast by the material suppliers in arbors and the manufacturer again does the drilling, assembling, and polishing. In designs where a handle cannot be easily slipped out of the arbor because of undercuts or contours, the handles are molded in split steel molds. The Lucite ware handles are injection molded of clear acrylic with an undercut which allows the black acrylic sleeve to be slipped over the top of the handle and cemented into place.

Carving set has cast phenolic handles. Sweeping lines are broken only by the finger rests

Wide varieties of patterns and colors are possible. Conservative patterns and colors suggest formality, help put plastic handles in the dining room instead of only in the kitchen

The largest hobbing press in the plastics industry



Hobbed Cavities *by* Midland . . .

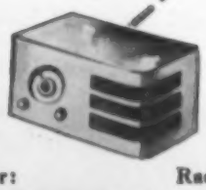
An important addition to Midland's expanding facilities is this 8000 ton hobbing press, the largest of its kind in the plastics industry.

This mammoth press with a ram diameter of 39½ inches makes it possible for Midland to hob cavities of approximately 80 square inches . . . almost tripling former hobbing limits.

With this press, Midland is prepared to supply plastic molders with hobbed cavities for large plastic parts including radio cabinets, large container escutcheons and instrument housings. Multiple cavities can be hobbed . . . "like peas in a pod" . . . quickly, with complete uniformity and accuracy. Multiple cavities will speed up your production with a minimum of expense.

Midland experience and facilities, in addition to skilled craftsmen, are ready to serve you . . . to produce the finest and deliver on time when you specify "Hobbed Cavities by Midland."

Write for your copy of "How to Heat Treat Hobbed Cavities," a practical heat treating treatise to help you get the best performance from Hobbed Cavities by Midland.



Radio Cabinets

Escutcheons

Instrument Housings

Cavities for:

MIDLAND DIE AND ENGRAVING COMPANY

1800 W. BERENICE AVENUE • • • CHICAGO, ILLINOIS

Makers of Plastic Molds ★ Die Cast Molds ★ Engraved Dies ★ Steel Stampings ★ Hobbings ★ Pantograph Engraving

Plastics Engineering*

F. B. STANLEY, Engineering Editor

Fillers for phenolics

by LAWRENCE DEBING†

FILLERS ARE of primary importance in the proper formulation of thermosetting molding powders. The over-all properties of molded articles can be radically changed by varying the available fillers while only minor changes are brought about by changes in the resin formulation. The principal thermosetting resins are phenol-formaldehyde (furfural), urea-formaldehyde, and melamine-formaldehyde, as contrasted with a host of fillers which are or can be used in molding powders. [This article is confined to a discussion of fillers for phenolic molding powders; fillers for ureas and melamines are discussed on page 132.—*Editor.*]

Fillers are used not only to obtain the desired properties but also to reduce costs in the finished molded article. An initial formulation, which permits the use of an inexpensive filler, such as wood flour, results in a substantial reduction in raw material cost. The use of a filler, such as wood flour, also reduces molding powder processing costs as well as molding or fabricating costs.

Specifications

The ideal filler should have the following properties in addition to those obviously required for a specific end use:

1) Uniformity—a dependable quality maintained throughout a given shipment and from shipment to shipment.
2) Low cost and adequate supply.
3) Low bulk—fluffy fillers are difficult to process and bulky molding powders often require special handling.
4) Uniform moisture content, preferably low.
5) Freedom from chemicals likely to stain or corrode steel molds.
6) No effect on molds—low abrasiveness.
7) Low specific gravity.
8) Readily wetted and coated with resin.
9) Low cost finishing operation of molded articles.
10) Good color and no solubles subject to "bleeding."
11) No special packaging or storage requirements.

Other requirements

In addition to tabulating the basic requirements of a good filler, it is desirable to place further emphasis on some less tangible requirements. Thus, the filler should be easily processed in conventional equipment and with standard resins—a special resin and special equipment may do a better job but the inducements to determine this must then be self evident. It should have molding qualities fully equal to equivalent grades of molding powder. The most frequently mentioned properties of a new filler are that it flows well and cures fast but all too often this is considered to be true after conducting only a few tests in compression molds of the hand operated type. Flow by compression, transfer, and injection molding must be considered.

Closely allied with the degree of cure is the hardness or rigidity of the molding as ejected from the hot mold. This factor is often overlooked or minimized in hand mold operation but its importance is strikingly apparent in automatic molds when ejector pins badly distort the moldings or a slight cocking of the piece jams the operations and calls for manual correction.

Another item often omitted in a list of molding material properties is the ease with which finishing operations can be conducted in the molded piece. For example, can the piece be drilled and tapped, can the flash be readily removed by tumbling barrel operation, or can the surface be buffed or a sanded surface be restored by buffing? All of these factors and others must be considered in the investigation of fillers for plastics. No small obstacle to the introduction of special materials in this category is that they require special handling by the molder and it is his aim to simplify his work by using only interchangeable powders in a given class.

Filler types

A very large number of materials both organic and inorganic have been used as fillers in phenolic molding powders. The following tabulation covers not only

* Reg. U. S. Patent Office.

† Group leader, Research Dept., Monsanto Chemical Co., Plastics Div., Springfield, Mass.

those materials which are commonly used today but also a large number of materials which for one reason or another have not been accepted as fillers or are used to a very limited extent. W. C. Gangloff[1] has briefly described 19 different fillers used in plastics. V. Meharg[2,3] has discussed the role of fillers in thermosetting molding materials and their requirements.

Wood flours—Wood flour is used to a greater extent than any other filler in thermosetting molding powders. The most commonly used woods are the soft ones such as pine, Norway fir, Douglas fir, and spruce. Soft woods having high natural resin contents are not as satisfactory as those of lower resin content. Hard woods such as maple, birch, oak, and beech have been used but their relatively poor color limits their application. In any case, the woods used are carefully selected to hold to a minimum contamination due to knots and bark. The presence of such material tends to show up as spots in the surface of molded articles.

J. H. Wredden[4] has discussed in great detail the histological elements of woody structures. Assuming that only the cellulose and lignin is desired in wood flour, he shows that only the mature or heartwood portion of wood is the logical choice for wood flour. The immature woods contain larger proportions of sapwood. This sapwood contains the starchy and sugary cell contents detrimental for electrical applications or maximum resistance to moisture absorption.

The reduction of wood[5] to a wood flour to obtain the optimum strength properties in the particles or fibers is discussed on the basis of the original structure of the wood. It is recommended that hard woods be given added consideration since if properly processed the resultant flour should have superior strength.

Messaranduba wood flour,[6] a tropical wood, has been found to impart excellent finish and flow to phenolic molding powders. Persimmon and Peruvian mahogany wood flour[7] imparted poor flow and surface finish. Greenheart, stauba, and lignum vita wood flours[7] also impart good flow characteristics to the molding powder but the finish of the molded surface is poor, as is also the case with Spanish cedar,[7] with the added result that its volatile oil content causes it to process as if it contained a large amount of lubricant. Very recently, a series of redwood flours and fibers have been placed on the market but it is too early as yet to judge their value as fillers.

Fibrous fillers—As previously stated, the more fibrous fillers are generally used to impart greater strength to phenolic moldings than normally obtained with ordinary wood flours. The term ordinary wood flours is used to differentiate these from more recent "wood flours" which have been ground or defibered to give varying lengths of fiber. These fibers produce moldings having good strength characteristics. The bulk of the molding powder is also in the desired range. The primary improvement in strength obtained through the use of fibrous fillers is in impact strength, as shown in Table I. This tabulation illustrates the very wide range in impact strength possible with a change in the filler used. The other very important property shown is the apparent density, which changes considerably with the type of filler used and varies inversely with the impact strength. This is a highly undesirable feature of fibrous fillers since these bulky materials require special handling by the molder. The present-day molder seldom uses molding materials in powder form. He has found that his over-all efficiency can be improved by forming the powder into dense pills or preforms of uniform weight which are then easily placed in the mold cavities. Obviously it becomes progressively more difficult to prepare preforms in automatic machines as the molding materials become more bulky. Materials having apparent densities below approximately 0.35 gram per cc. require special handling and the most bulky types are preformed by hand. Recently a preforming machine of improved design has been placed on the market and it is claimed that this machine will handle automatically the bulky materials of the cotton fabric type.

Cotton flock, fabrics, and cord—The cotton used is principally obtained by mascerating or defibering waste shirt cuttings. The mesh size or fiber length is carefully controlled to insure consistent properties in the molding powder. Care in the selection of scrap material is extremely important to avoid contamination, particularly metal contamination. Steinfield[8] has discussed the general subject of cotton flocks. Cotton linters can be used although it is claimed that they are somewhat more bulky than cotton flock. F. Rosenthal[9] has used cotton-seed hulls and fiber as a filler in molding powders. The mascerated fabric fillers vary considerably as to weight, weave, twist, etc. Considerable care is necessary in obtaining a uniform quality of fabric. Rayon fabric should be eliminated since it is not easily wetted by the resin and as a consequence it shows up as a defect in the surface of the molded piece. Cotton cord has been used to produce moldings of maximum impact strength. For economic reasons, a waste source of cord is necessary and such a source was found in the tire industry. It should be mentioned that the cord waste must be obtained before it comes in contact with any rubber since it has been found that even minor particles of rubber cause surface imperfections in the molded piece. Oil which has been used in the manufacture of the cord was also found to be very objectionable when it occurs in excessive amounts in sections of the cord.

Asbestos fiber, fabrics, and cord—The amount of asbestos fiber used as a filler is relatively small. So-called asbestos floats (see Mineral Fillers) is used to a considerable extent but this material contains very

[1] W. C. Gangloff, Chem. Ind. (N. Y.) 53, 512–514 (1943).
[2] Virgil Meharg, MODERN PLASTICS *15*, 46–49 (Oct. 1937).
[3] Virgil Meharg, MODERN PLASTICS, *16*, 30, 31 (Oct. 1938).
[4] J. H. Wredden, Plastics (London) *10*, 76–82, 90, 126–133, 174–184, 233–239, 276, 286–292 (1946).
[5] J. H. Wredden, Plastics (London) *11*, 37–43 (1947).
[6] J. Lum, U. S. 2,337,523, Dec. 21, 1943.
[7] Plastics Div., Monsanto Chemical Co.—Unpublished data.
[8] F. Steinfield, MODERN PLASTICS *14*, 62 (Oct. 1936).
[9] F. Rosenthal, U. S. 2,326,569, Aug. 10, 1943.

little asbestos fiber as such. During the latter part of World War II considerable interest was displayed by the Armed Services in heat resistant products with impact strengths equivalent to the strongest grades of cellulose filled phenolics. This can be accomplished using special grades of asbestos cloth and cord. Acceptable asbestos fabric materials can contain up to 20% of reinforcing cotton thread and still meet very rigid heat resistant requirements. Special care in processing these materials is necessary to avoid degrading the asbestos fiber length with a resultant loss in strength.

Glass thread—Although glass filaments cannot be classed as fibers, they are placed in this category because they fulfill the same end use. Glass fabric and cord can be used as fillers to produce moldings of exceptional impact strength—higher than that obtainable with any other filler. Difficulties in handling the cord or fabric in the preparation of molding powders have restricted their use primarily as a filler for laminates.

Sisal and other vegetable fibers—Even though sisal is one of the strongest of vegetable fibers it has not been used to any great extent as a filler in molding powders. The fiber is quite readily broken down during processing and is not easily wetted with resin, so that the surface appearance of moldings is only fair. While the water absorption of moldings based on sisal filler is not excessive, the surface of the moldings is adversely affected in that the fiber near the surface tends to swell and roughen the surface. Minor references can be found to the use of other hemp fibers such as ramie and jute but none of these fibers are satisfactory for general applications. J. H. Wredden[10] has recommended that the fibrous protection of coconut known as coir fiber be used as a filler.

Mineral fillers—The principal mineral fillers used are asbestos, mica, and diatomaceous earth. Of lesser importance are fillers such as clay, vermiculite, quartz, barium sulphate, lead, and iron oxides. Mineral fillers are used primarily to obtain a specific property such as asbestos for heat resistance, mica for electrical properties, or a lead oxide for extremely dense materials. Asbestos floats, clay, and diatomaceous earth are often used in conjunction with wood flour to modify a molding material, for example, to improve the molded appearance, reduce mold shrinkage, or to improve water resistance.

Asbestos—The most abundant variety of asbestos used as a filler in plastics is known as chrysotile. This is a hydrated magnesium silicate. The bulk of the asbestos fiber used is classified as floats. The particles, obtained by air flotation process, vary from microscopic dust to fibres $^1/_{16}$ in. in length. Cummins[11] has discussed the type of asbestos to be used as a filler for plastics to obtain specific properties. W. Francis and J. Grayson[12] have studied the properties of chrysotile asbestos in relation to electrical insulation. To obtain optimum electrical properties, care must be exercised in the relation of the chrysotile and the water soluble impurities and conducting particles often present must be removed.

Mica—Mica, in finely ground form, is the principal filler used in plastics to obtain low-loss electrical properties. It is incorporated in molding materials in the same manner used with other ground fillers but special care is required since mica is nonabsorbent and not easily wet by the resin. E. E. Halls[13] has listed India and Canada as the two chief sources of mica. The first source supplies the Muscovite or potash group of micas, chemically formulated $H_2KAl_3(SiO_4)_3$ and the second source furnishes the phlogopite micas, $HK(MgF)_3Mg_3(AlSiO_4)_3$. The specific gravity of these micas lies between 2.76 and 3.0. Both grades are considered acceptable for electrical applications but of the two the Muscovite grade is slightly superior. Vermiculite[7], a hydrous silicate of some form of mica, does not have acceptable electrical properties.

Diatomaceous earth(clay and other mineral fillers)—The use of diatomaceous silica in plastics has been discussed by A. B. Cummins.[14] Diatomaceous silica and clay are used to a minor extent to improve the surface finish of molded articles, and to modify other properties such as flow, shrinkage, and water resistance. For most applications, it is found that asbestos floats will produce the same result and this is the filler most commonly used.

A primary objection to all mineral fillers is, of course, their high specific gravity. Therefore, to obtain the foregoing improvements the amount of mineral filler used is held to a minimum. The importance of this is obvious when it is realized that the molder purchases molding powders on a pound basis but sells it on a volume basis as a molded article. Diatomaceous silica has a slight advantage in that its specific gravity is 2.0 to 2.3 as compared to 2.45 to 2.80 for asbestos. The composition and description of asbestos and diatomaceous silica has been reported by A. B. Cummins and V. E. Meharg.[15]

The flow characteristics of phenolic moldings can be altered considerably by incorporating higher percentages of mineral fillers. During the present shortage of phenol, asbestos floats have been used to extend phenolic molding powders. This is accomplished by substituting asbestos for a portion of the resin normally contained in the formulation. Aluminum silicate[16] in the form of a very fine white powder and having a specific gravity of 2.75 has been recommended as a filler but has not become an important factor, no doubt due to a lack of any outstanding property although it is claimed that the "slip character" of the filler permits a reduction in the lubricant required in the molding composition.

Lead and iron oxides, because of their high specific gravity, have been used in powders for the molding of frangible bullets and compounds of barium and lead have been used for molding X-ray equipment shields;

[10] J. H. Wredden, Plastics (London) *10*, 545–546 (1946).
[11] A. B. Cummins, Modern Plastics *14*, 50, 52, 53, 56 (Oct. 1936)
[12] W. Francis and J. Grayson, J. Soc. Chem. Ind. *60*, 160–166 (1941).
[13] E. E. Halls, Plastics (London) *6*, 352 (1942).
[14] A. B. Cummins, Modern Plastics *14*, 57–58 (Oct. 1936).
[15] A. B. Cummins, Modern Plastics *17*, 51, 52, (Oct. 1939); and Virgil E. Meharg, Modern Plastics *17*, 53, 54 (Oct. 1939).

Table I.—Effect of Fillers on Impact Strength

Filler used (50%)	*Impact strength*	*Bulk or apparent density*[a]
	ft. lb./in. of notch	*grams per cc.*
Wood flour	0.26–0.34	0.50–0.63
Wood fiber	0.4 –0.55	0.35–0.40
Cotton flock	0.5 –0.80	0.25–0.35
Cotton fabric	1.2 –3.2	0.10–0.15
Cotton cord	6 –8	0.10–0.20

[a] Apparent density is the weight in grams of 1 cc. of the loose powder. It is determined by weighing a given volume, usually 100 cc. of this material.

mineral fillers such as zinc oxide, titanium dioxide, zinc sulphide, and the mixed pigments of the lithopone type are used in the production of colored molding powders. These white, opaque pigments are necessary to mask the tan color of phenolic-wood flour mixtures and provide a suitable base for showing up the true color of added dyestuffs.

Shell fillers—Of the various organic fillers used in plastics, other than wood flour or cotton flock, shell flours have come the closest to large scale commercial acceptance. Of the various shell flours, walnut shell flour has received the greatest attention and has been used to the greatest extent. J. R. Spencer[16] reviewed the investigation conducted by the Nobell Research Foundation. Walnut shell flour was initially developed as a filler for phenolic casting resins. The lower bulk of the shell flour permitted higher loadings than possible with wood flour. The shell flour was also investigated as a filler in phenolic molding powders. Attempts were also made to produce a molding powder from the flour alone through hydrolysis and subsequent plasticization. Thermoplastic materials low in strength and having poor resistance to moisture were obtained.

E. F. Lougee[17] has pointed out that moldings prepared from phenolic-walnut shell flour composition have excellent gloss and surface appearance and high dielectric strength. The physical strength properties, with the exception of tensile strength, are approximately the same as for wood flour mixes. The poor tensile strength is no doubt due to the non-fibrous nature of the shell flour. More recently, coconut shell flour has been introduced as a filler. The results obtained are very similar to those obtained with walnut shell flours. J. H. Wredden[18] has included coconut and walnut shell flours in his microscopic examination of various fillers. He points out that the continuous and intercommunicating system of channels in the coconut shell structure may be filled with resin during the molding operation or preparation of the molding powder and thus account for the strength properties which are better than would be expected of a relatively non-fibrous filler. It is also suggested that the shell filler contains more reactive lignin which could improve the surface bonding between the filler and the resin.

The histological characteristics of walnut shell are shown by Wredden to be such that grinding should produce a flour exhibiting properties lying between wood flour and coconut shell flour. G. B. E. Schueler[19] has presented comparable data on molding materials based on coconut shell flour and wood flour. Briefly stated, the former is shown to have improved flow, lower specific gravity, higher shrinkage, lower water absorption, better electrical properties, higher impact strength but lower tensile strength than the latter. A comparison of the chemical composition of walnut shell and coconut shell is also given and shows the two to be quite similar.

Commercial usage of walnut shell flour and recent evaluation of coconut shell flour[7] give substantial support to the above statements. One defect which has been noticed and not previously mentioned is a mottled surface effect obtained with either shell filler. The defect is not a factor in most applications but it does nullify to a great extent the otherwise excellent surface appearance. This mottle effect has been thought to be due to contamination by nut meats but it may also be inherent due to the cut in content of the shells.

Apricot shell flour has a chemical composition which is very similar to walnut shell flour. Both flours are also very similar in molding composition when compared as to flow and appearance of the molded surface. Pecan and almond shell flours[7] are also in a class with walnut shell flour. Minor differences as to flow and surface appearance have been noted but such observations are inconclusive since little is known about how the samples of these shell flours were prepared. Peanut shell flour[7] has been found to improve the molded surface appearance but the flow properties were unimproved. M. Phillips and M. J. Goss[20] have presented data on the chemical composition of the shells of almond, Brazil nut, "candle" nut, coconut, walnut, filbert, and pecan.

Miscellaneous fillers—The filler materials placed under this heading are those which could not readily be classified under the previous headings. Many of these materials are residues and by-products of chemurgic processes. Attempts have been made with many of these products to produce molding compounds without the use of added bonding materials such as phenolic resins. The possibility of more fully utilizing the potential reactivity of lignin and also the conversion of pentasans to furfural has held the attention of many investigators. This phase of plastics development is only briefly called to the reader's attention since it is so closely allied to the subject of fillers in that the residues obtained are often used in whole or part as the filler component.

T. F. Clark and L. I. Aronovsky[21] have investigated bagasse, tobacco stalks, oat straw, cornstalks, flax

[16] J. R. Spencer, Pacific Plastics, *1*, 26, 27 (1943).
[17] E. F. Lougee, Modern Plastics *19*, 35–37 (Feb. 1942).
[18] J. H. Wredden, Plastics (London) *10*, 394–399, 486–493, 545–551, 596–600, 657–663 (1946).
[19] G. B. E. Schueler, Plastics (London) *10*, 84–90 (1946).
[20] M. Phillips and M. J. Goss, J. Assoc. Official Agr. Chem. *23*, 662–665 (1940).
[21] T. F. Clark and S. I. Aronovsky, Modern Plastics *22*, 162–164 (Dec. 1944).

shives, wheat straw, rye straw, and corncobs by four different methods of hydrolysis. The residues were ground, mixed with plasticizers and molded. Such molding materials are thermoplastic and cannot compete in molding performance or with the molded properties of phenolic molding powders. Clark[22] has also investigated corn cobs, cornstalks, wheat straw, flax shives, hemp hurds, and peanut shells by the conventional method of grinding these materials, and mixing the flour with phenolic resins. None of these products produced compositions having the water resistant properties of commercial compositions. Improved results were obtained with a specially prepared phenolic resin.

Meharg[3] cites hemp hurds as a filler material which when ground has an appearance very similar to wood flour but which fails due to poor water resistance, lower physical strength, higher shrinkage, and poor surface appearance. T. R. McElhinney[23] reports that the original attempts to produce a moldable resinous product from bagasse in situ failed. Better results were obtained by mixing a bagasse filler with a specially prepared bagasse resin than by the use of a wood flour filler with the bagasse resin. However, when phenolic resin was substituted for the bagasse resin opposite results were obtained.

Keratin, in the form of chicken feathers, cattle hoofs, and hog bristles, have been investigated by G. H. Brothers.[24] A flour was first prepared and then compounded with a commercial two stage phenolic resin. The molding powder exhibited fair flow but required longer cure than phenolics. Inferior water resistance and strength were also obtained.

Considerable investigation has been centered on the use of soybean meal as a potential binder and filler in plastics. L. L. McKinney, et al., [25, 26] compounded soybean meal with phenolic resin and found that the resultant molding powder was brittle and slow curing. All further work was conducted with soybean-wood flour mixtures. The authors also studied the pretreatment of soybean meal to improve its resistance to moisture pick up. Soybean meal modified by a preliminary leaching followed by heat desaturation was found superior to a previous process of hardening the meal with formaldehyde.

In general, the strength properties, particularly impact strength, of these mixes are lower than standard phenolics. Resistance to water is very poor and to obtain molding materials approaching standard phenolics in this respect only small amounts of soybean meal which has been previously treated can be used. The commercial use of a soybean plastic by the Ford Motor Company has been described by W. T. Cruse.[27] Somewhat similar results have been obtained with cotton seed meal.[28]

J. G. Meiler[29] has described a lignin enriched filler which was recommended during the war years as an extender for phenolic molding powders. By the use of this extender, it was claimed that less phenolic resin was required to obtain flows equivalent to that of standard materials. Considerable quantities of this filler were used but the degree of extension possible was not as large as originally thought possible and the use of this filler has declined. The filler was prepared by cooking waste wood with waste lignin solution. The advantages claimed for the process were that: 1) lignin of the waste wood was converted to a plastic form; 2) lignin from the waste lignin solution was precipitated on the wood; 3) the pulp wood improved grinding; and 4) the soluble constituents of the wood are removed through hydrolysis.

R. Katzen and D. F. Othmer[30] have reviewed the subject of wood hydrolysis and describe a process for the continuous production of a semi-plastic filler for phenolic molding powders. The material was evaluated on a pilot plant scale but failed to obtain commercial acceptance. A material of a similar nature is at present being evaluated as a filler. This product is produced by the Masonite process which has been used for many years to produce a molded or pressed

[22] T. F. Clark, R. V. Williamson and F. C. Lathrop, MODERN PLASTICS *23*, 158–160 (Oct. 1945).
[23] T. R. McElhinney, MODERN PLASTICS *20*, 64, 65 (Nov. 1942).
[24] George H. Brother, Charles H. Binkley and Beatrice Brandon, MODERN PLASTICS 22, 157–160, (March 1945).
[25] L. L. McKinney and G. H. Brother, MODERN PLASTICS *18*, 69–71 (May 1941).
[26] L. L. McKinney, R. Deanin, G. Balcock, and A. K. Smith, Ind. Eng. Chem. *35*, 905–908 (1943).
[27] W. T. Cruse, MODERN PLASTICS *17*, 23–29 (Jan. 1940).
[28] F. Rosenthal, Ind. Eng. Chem. *34*, 1154–1157 (1942).
[29] J. G. Meiler, MODERN PLASTICS *20*, 64–66 (Sept. 1942).
[30] R. Katzen and D. F. Othmer, Ind. Eng. Chem. *34*, 314–322 (1942).

Table II.—Properties of Phenol-Formaldehyde Molding Powders

Test	*General purpose cellulose filled*	*Low to intermediate, shock resistance flock filled*	*Heat resistance mineral filled*	*Superior high frequency insulation, mineral filled*
Mold shrinkage, in./in.	0.0055–0.009	0.004–0.008	0.002–0.005	0.001–0.005
Specific gravity	1.32–1.47	1.35–1.46	1.60–2.00	1.75–2.00
Water absorption, % 24 hr.	0.4–0.8	0.4–1.0	0.1–0.25	0.02–0.07
Dielectric strength, step by step, v./mil.	275–375	150–300	200–350	300–400
Volume resistivity, ohm/cm.	$0.01–10 \times 10^{11}$	$0.01–10 \times 10^{11}$	$0.01–10 \times 10^{11}$	$10^{11} = >10^{14}$
Dielectric constant, 1,000,000 cycles	4.5–5.5	4.5–6.0	5.5–7.0	4.5–5.0
Power factor, 1,000,000 cycles	0.08–0.05	0.03–0.06	0.05–0.10	0.005–0.009
Impact strength, Izod, milled notch, ft.-lb./in.	0.24–0.40	0.5–1.0	0.24–0.32	0.30–0.38
Tensile strength, p.s.i.	6500–9500	5000–8500	4000–6000	5000–7000
Flexural strength, p.s.i.	9000–12,000	8000–11,000	7000–9000	8000–11,000

board. The process and board product has been briefly described by R. M. Boehm.[21] Cork dust, spent beer hops, furfural process residues, dried citrus pulp, cocoa bean material, peat moss, flax shives, leather milkweed products and various miscellaneous mineral fillers such as slate dust, slags, quartz, and glass powder have all been considered and in some cases tested[7] as fillers in phenolic molding powders. All of them have failed either because of poor physical properties in the molded piece or because of poor moldability.

Industrial demands or needs

Table II, compiled from data listed by the Plastics Materials Manufacturers' Association[22] covers the principal properties obtainable with phenol-formaldehyde molding powders. The range of properties listed in columns 1, 2, 3, and 4 encompasses the values obtainable with wood flour, cotton flock, asbestos, and mica, respectively.

The tabulated data clearly illustrate that four fillers or combinations of those four fillers can be compounded with phenolic resin to produce molding powders having a very wide range of properties. It also illustrates that the ideal filler has not been attained since four different fillers are required to produce the range of properties needed by industry. However, in lieu of the ideal filler, if superior properties can be attained for specific end uses by special fillers without the sacrifice of other desirable characteristics, such fillers will be looked upon with favor.

Figures compiled by the Bureau of the Census of the U. S. Department of Commerce show that the total production of phenolic molding powders for the year 1946 was 140,216,433 pounds. The production figure for the first six months of 1947 was 91,831,457 lb. as compared to 73,730,779 lb. for the same period in 1946. To arrive at some figure for the relative quantities of filler used, it is probably safe to assume that 50% by weight of the molding powder is composed of filler and that of the fillers used, 60 to 80% is wood flour, 15 to 30% is asbestos, and that the balance of 5 to 10% is made up of all other fillers.

[21] R. M. Boehm, MODERN PLASTICS *15*, 26, 27 (Oct. 1937).
[22] Technical Data on Plastics, April 1945, Plastics Materials Manufacturers' Association.

Fillers for ureas and melamines

by PRESCOTT FULLER*

ALTHOUGH many fillers have been tried with urea-formaldehyde compounds, it has been found that an alpha-cellulose filler is most compatible with these resins, and currently all urea-formaldehyde molding materials are produced with this filler. A highly purified form of alpha-cellulose pulp, this filler permits coloring of the molding powder to any desired shade, assures a smooth surface in the molded part, and provides sufficient strength for typical urea applications.

One of the essential differences between urea and melamine-formaldehyde resins is the fact that the latter are compatible with a wide range of cellulosic and mineral type filler materials. Innumerable fillers have undergone experimentation, but only a few have been found acceptable in terms of desired applications and of economics.

Alpha cellulose filler is used with melamine-formaldehyde resin for the production of molding compounds similar to the ureas in appearance, range of colors, and types of application.

Mineral fillers

Melamine-formaldehyde molding materials first gained their reputation in the electrical insulation field. During the war, it was necessary to develop some compound which had the strength, electrical characteristics, and moldability required for aircraft insulation parts. Consequently, laboratory work brought forth several types of mineral filled melamine-formaldehyde molding materials. The actual filler used is a finely ground asbestos which is incorporated with the resin on high speed rolls. For compounds having definite requirements of strength, varying fiber lengths, of asbestos may be used. Mineral fillers impart non-burning, heat resistant properties; exceptional electrical insulating characteristics; low water absorption; and excellent strength in the molded part.

In order to increase moldability and economy of use with melamine industrial molding materials, a wood flour filled material was developed and has been improved during the past year. This compound, although filled with a cellulosic material, provides essentially the same physical and electrical characteristics as the mineral filled compounds. In addition, it is easier to mold, and the new formulations reduces to a minimum any tendency toward cracking around inserts and stresses due to aging.

Fabric filled materials

The field of fabric filled melamine molding materials has become increasingly (*Please turn to page 238*)

* Plastics Div., American Cyanamid Corp., 30 Rockefeller Plaza, New York City.

Improved internally heated spreader

PROBABLY THE most important component of an injection molding machine is the injection cylinder and spreader combination. Several years ago the Lester Engineering Co., Cleveland, Ohio, developed an internally heated spreader to speed up the plasticizing of the thermoplastic material being molded. With this spreader the heat load into the material was derived not only from the usual heater bands mounted on the outside surface of the heater cylinder but also from the spreader itself.

This heating method made possible the use of lower thermocouple temperatures which in turn eliminated much of the problem of burned material.

The bottom of the cylinder and the upper part of the spreader form a uniform annular space in the center portion of the cylinder. Three projections on the upper sides of the spreader support it from sidewise deflection. However, since these supports are in the cold zone there is very little chance for the plastic material to melt and lodge behind them. The possibility of trapped material is further eliminated by the 0.020-in. clearance between these supports and the cylinder walls.

Tapered spreader

The first design for this internally heated spreader has been advanced in several important respects. The temperature control of the spreader is accurate within a few degrees, independent of the cylinder wall temperature. Further, disassembly of the cylinder has been made simpler through the use of a taper fit between spreader and cylinder bore.

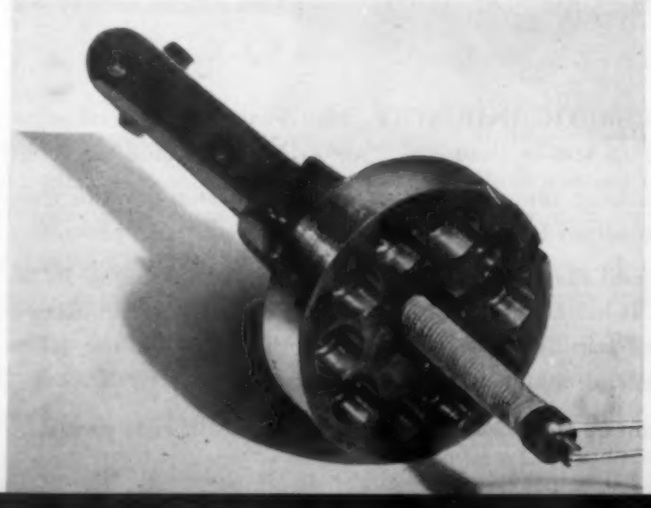
Testing has shown that any separate, fitted component in the bore of an injection cylinder, on heating, will move away from the cylinder wall unless the piece itself is independently heated to a higher temperature. This tendency for a ring under heat to expand away from its mating plug is overcome with a shrink fit at the taper and independent heat control of the spreader.

The latest improved design makes use of a spreader with a tapered fit into the cylinder. The two surfaces are ground and lapped before assembly. This joint is easy to disassemble because the cylinder will expand quickly under heat, leaving the spreader comparatively free to be withdrawn.

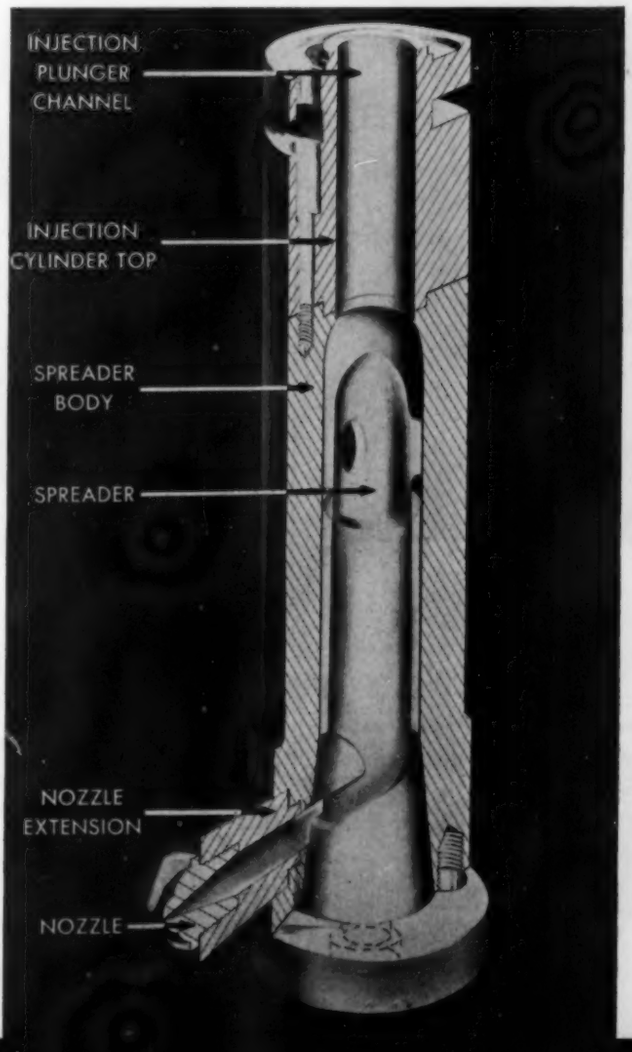
This new internally heated unit is easy to purge because of the temperature control on the spreader and because of its streamlined construction and excellent joint arrangement. It is said that, due to the excellent plasticizing ability of this design, less power is required to operate the pumps, less current is necessary for the heaters, maintenance cost is reduced, and production is greatly increased. Such engineering developments in the plastics industry are of paramount importance if the industry is to continue to forge ahead as it has done in the past years.

Special heating element for spreader is shown partially assembled inside of unit. Three protrusions on upper left end serve as support

PHOTO AND DRAWING, COURTESY LESTER ENGINEERING CO.



Schematic cutaway of spreader in heating cylinder. Material is forced by injection plunger around spreader through nozzle into mold



These Max Factor Hollywood molded Plaskon trays measure: Gray, 15½" x 10½" x 1⅜"; Red, 15" x 8½" x 1¾". These trays are molded by Plastic and Die Cast Products Corp. of Los Angeles, Cal.

A LEADER IN THE COSMETIC INDUSTRY, Max Factor Hollywood now introduces these new make-up sets in beautiful Plaskon Molded Color tray containers. This is a cosmetic merchandising innovation, and again illustrates the effectiveness of Plaskon Molded Color as a medium for attracting consumer interest and promoting sales.

Max Factor Hollywood has used Plaskon molded color for a great number of its packages and closures for many years. It has taken advantage of the *thermosetting* properties which include excellent dimensional stability, low water absorption, non-softening action from heat and its ability to withstand common organic solvents.

Plaskon molding materials can be transformed into almost any distinctive, practical design

For Famous Products

Max Factor
HOLLYWOOD

or size of product. A wide range of clean, brilliant, permanent colors is available. The hard, non-porous surface of molded Plaskon will not tarnish, check or corrode. It is impervious to the effects of alcohol, acetone, oils, waxes or greases.

Molded Plaskon has many other features that meet special requirements in the drug, cosmetic, electrical, household appliance, garment and general industrial fields.

Write for free illustrated book showing many uses of Plaskon* urea-formaldehyde and melamine-formaldehyde molding materials in manufacturing and merchandising.

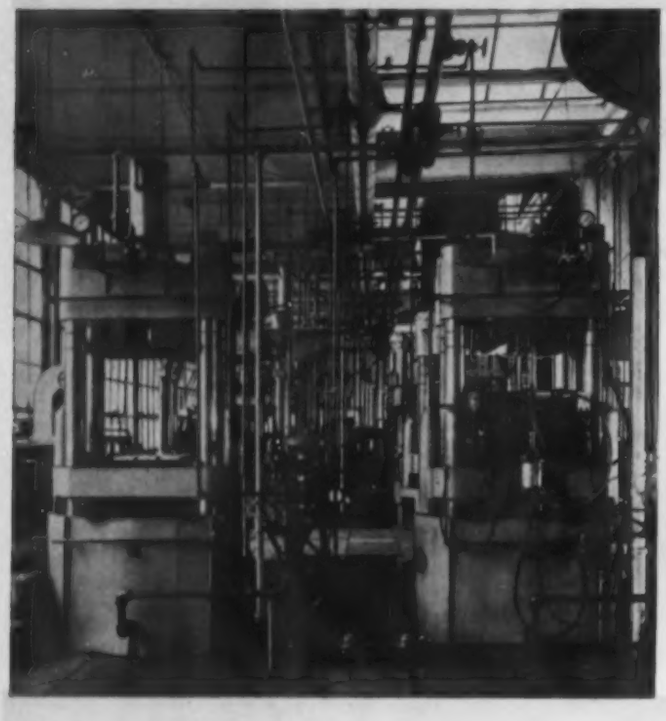
PLASKON DIVISION • LIBBEY • OWENS • FORD GLASS CO. • 2121 Sylvan Ave., Toledo 6, Ohio

In Canada: Canadian Industries, Ltd., Montreal, P. Q.

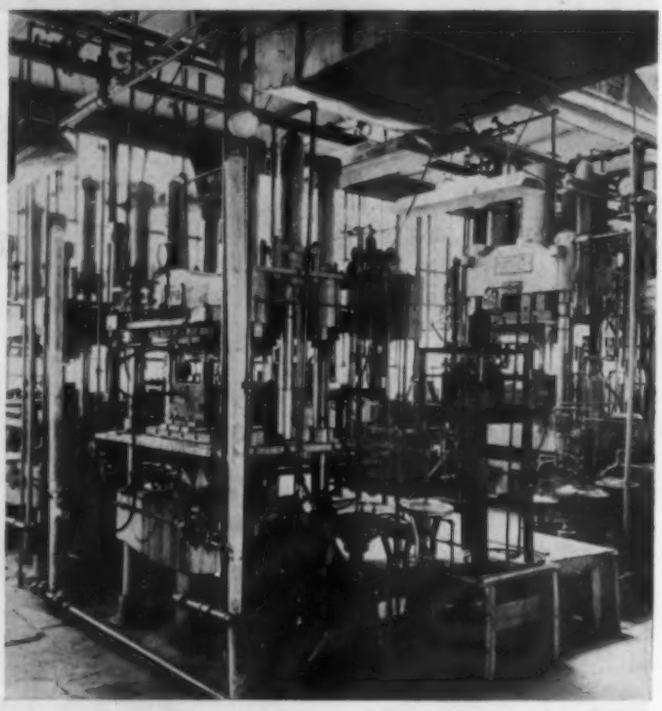
*Reg. U. S. Pat. Off.

Better quality—faster molding

How one plant improved existing equipment and facilities to increase its output and provide better quality control



Micro switches on press at right prevent closing when mold wedges are improperly aligned



Air operated pilot valves facilitate push button control and timing of press operations

EXPERIENCE with wartime production and a foreseen need for faster molding of thermosetting materials were the two main factors which influenced the post-war plans of Shaw Insulator Co., Irvington, N. J. Work, which started shortly after V-J Day, has been completed and the results have amply justified the effort. The program was directed toward the improvement of existing presses and facilities to increase output and to provide better quality control. In addition to the mechanical changes, a development laboratory was built to facilitate advanced study of molding methods and to house the considerably expanded engineering department.

Through a combination of methods designed to obtain greater operating efficiency, capacity for molding thermosetting resins was increased 300 percent. All previously unconverted compression presses were provided with auxiliary transfer rams. New heads were made for some of the old presses; others were prepared by merely boring the heads and providing suitable cylinder mounting facilities. Interchangeable two-way cylinders were used to simplify the maintenance problem; hydraulic cylinders were used for the large presses and air for some of the small units.

A second important press improvement was the installation of air operated hydraulic pilot valves for both the main and the auxiliary rams to obtain push button and fully automatic cycle control. This equipment is also used with micro-switch or cam-operated valve control to provide safety interlocks on all movable members so that molds cannot be damaged by careless handling and improper closing.

Time lost in opening and closing becomes a very important cost factor when 20 to 50 sec. cycles are planned for large presses. Therefore it was necessary to speed up the rate of press closing and opening in order to obtain full benefit from the fast transfer molding cures and the automatic press control. Maximum press speeds were achieved by the installation of large headers and connecting lines from the accumulators to the

presses. An additional gain resulted from the installation of a high pressure pump, driven by a large synchronous motor, so that full high pressure would be available at full load and with greatly accelerated opening and closing cycles.

Improved materials handling

Other auxiliary changes included the installation of increased compressed air facilities and the use of colors throughout the plant to identify all piping. Hand presses were regrouped to minimize mold handling, as were also the semi-automatic presses in order to facilitate either battery or unit operation and to provide ample space for preheating equipment. Increased press output required added space and improved materials handling equipment for the compound and the finished parts. The expanding use of molds with built-in side-core operating cylinders or other external devices also were factors in the press room layout selected.

Several presses of each size were equipped with external stripping and loading devices to facilitate the use of sliding tray molds for production jobs requiring numerous inserts. This permits maximum press output since the press is pressing all the time instead of being open during the insert loading time. This combination has permitted the design of molds which produce complex parts, yet operate on short cycles and give large output.

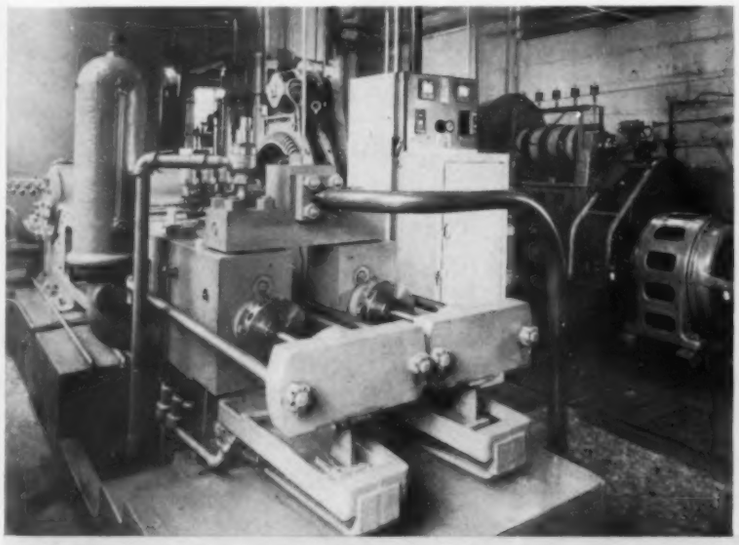
Numerous changes in mold design philosophy have contributed to the over-all capacity increase and reduced the cost of mold and press maintenance. The automatic press control system permitted the design of molds which reduced the human element factor to a minimum. Heavy production jobs are designed to eliminate all variables that might be introduced by the operator; this includes simple loading of the charge, push button starting and clock timing of the cycle, electrical or mechanical interlock of all side cores and wedges, and simplified ejection of molded pieces. All press timing controls are enclosed and sealed so that the cycles may not be changed by the operator. Power units were added where necessary to eliminate operator fatigue from operations that might be strenuous.

Material flow problems and simplification of inspection were a major consideration in the finishing room revision and the layout selected was designed to stop excessive handling of the pieces. All long running jobs are mechanized to assure uniformity of workmanship; air operated chucks, pneumatic control of drilling, multiple operation fixtures, and multiple drills are typical of the improved methods used for finishing.

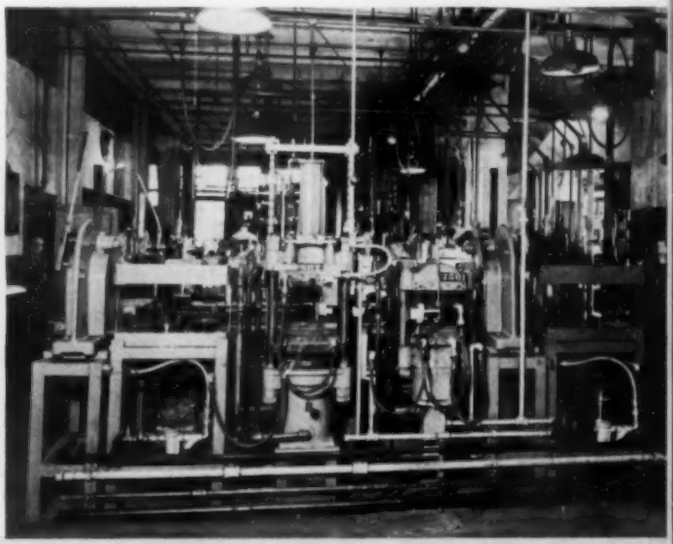
Research on molding procedure

Despite the attention which has been given to molding materials, equipment, and methods, there is still a great need for an over-all research job on molding procedure. The new Shaw laboratory is designed primarily for such studies. Work done here will include an accurate cost analysis of all known molding methods. Also, the basic types of molding equipment are being evaluated and the effect of mold design and molding methods on the physical properties of the finished piece are being studied.

Another important problem under investigation is an analysis of the property variation which results from the use of different molding methods. Since sprue, runner, and gate sizes may affect the ultimate strength of molded parts, an effort is being made to establish the optimum relationship between these many variables, It is hoped that all of them may be collated and the data tabulated in easily usable form.



Synchronous motor driven high pressure pump is shown in foreground, stand-by pump in background



Efficient arrangement of arbor presses, molding presses, and work tables accelerates production

A cup of woe for Mrs. Doe...

BUT HOT WATER WON'T DEFORM *ONE* OF THESE

BE SURE YOU GET THE DIFFERENCE

Two plastic cups may look very much alike. The difference is that one is made of the right plastic properly designed and applied. To make sure of long service, look for informative labeling or ask for the facts about plastic products you buy.

Jane Doe couldn't believe her eyes when she saw what the very hot water in her dishwasher did to one of her cups. But it needn't have happened—and *wouldn't*—if tableware made of the right plastics material had been sold to her.

The right plastics will not soften under exposure to hot water . . . especially if they are *thermosetting* like Cyanamid's BEETLE* or MELMAC* plastics. Also, dinnerware and kitchen utensils made of MELMAC or BEETLE compounds, being extremely hard-surfaced, resist constant hard wear, strong soaps and detergents. Furthermore, they do not attract dust and their color . . . be it brilliant, pastel, ivory or white . . . is permanent.

Remember this . . . *no one plastic serves all plastic needs* . . . no more than any one metal meets all metal requirements. So, when buying, selling or making plastic products or parts, request information that will assure you they are soundly designed in the plastic best suited for the jobs they must do.

QUESTIONS PLEASE! Our technical staff will be glad to help you solve problems in plastic application and design. And if our materials do not fill the bill exactly, we will cheerfully direct you to the right sources. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

Cyanamid
Plastics

DIVISION OF AMERICAN CYANAMID COMPANY

BEETLE* plastics—urea-formaldehyde thermosetting molding compounds. MELMAC* plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. URAC* resins—urea-formaldehyde thermosetting industrial resins and adhesives. MELURAC* resins—melamine-urea-formaldehyde thermosetting adhesive and laminating resins. LAMINAC* resins—thermosetting polyester resins.
*Reg. U. S. Pat. Off.

There Are No TWO Ways About Plastics...

No two ways about it . . . there is always an ideal plastic material for a given plastic part or product.

This puts it squarely up to plastics materials manufacturers to help the makers of finished parts and end products find and use the one *right* plastic material for any specific application.

It means, also, that the retailer and consumer should be enabled to discriminate in *their* purchases of plastics products.

That is why our current advertising campaign series (the third* of which is reproduced on the opposite page) is devoted to pointing out the need for realizing that *a good plastic is NOT a good plastic when wrongly applied.*

Thus in addition to promoting the sale of BEETLE** and MELMAC** molding compounds, we hope to play a part in strengthening the structure of the entire plastics industry.

*This advertising appears in such influential publications as Time, Department Store Economist, Chain Store Age.

AMERICAN CYANAMID COMPANY, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

**Reg. U. S. Pat. Off.

Post-forming of thermoset laminates

by LUCIUS GILMAN, WILLIAM J. POWERS, GEORGE R. RUGGER, and HARRY E. PEBLY, Jr.*

Specific information is given in the accompanying article on post-forming a dome-shaped article from thermoset phenol-formaldehyde laminates. The experimental part prepared had a maximum diameter of 5 1/2 in. and a maximum depth of 1 1/2 inches. The laminate used was 0.024 in. thick.

The authors conclude that: Two-dimensional draws of parts of this shape and with these dimensions can be performed on phenol-formaldehyde laminate formulated specifically for post-forming. The critical factors in draws of this type seem to be temperature, strength of restraining action between restraining ring and pressure ring, and clearance between restraining ring and plunger. Cylindrical draws can be performed with the same materials and using dies of similar design, but the maximum depth of draw without tearing is somewhat less.

THE PREPARATION of component parts by post-forming of thermoset phenol-formaldehyde laminates has been reported in a number of instances,[1–6] especially in the preparation of parts used for aircraft.[7–9] Most of these parts appear to have been channel shaped pieces of various cross-sections and to have been formed by simple bending, but a limited number appear to have been box or dome shaped and thus to have required drawing and forming in the same way that sheet metal is deep die drawn for numerous applications.

Although standard Grade L and Grade C phenol-formaldehyde laminates can be post-formed to a limited extent at elevated temperatures, special grades permit much deeper draws without tearing. All of the special grades appear to use a relatively loosely woven fabric in order to provide stretch as needed. There appear to be two general classes of resins used for this type of laminate. The first class consists of standard laminating resins with little or no plasticizer and is intended to provide finished articles which can be removed from the forming die while still very hot and to provide finished articles showing maximum rigidity. The second class consists of phenol-formaldehyde resins containing plasticizer and/or a percentage of aniline-formaldehyde resin to provide laminates showing the greatest possible degree of formability and to provide finished articles of maximum toughness.

In the preparation of plastic domes of the shape and size shown in Fig. 1, laminates containing the softer type of resin were required. Attempts to prepare the part from the stiffer type of laminate resulted in rips perpendicular to the flow of laminate at the base of the dome.

Drawing temperature

Successful drawing could be accomplished only by heating the material almost to the blistering point. Of the several methods of heating investigated, heating between sheets of asbestos paper on an electric plate proved to be the most successful. A sheet of asbestos paper on the electric plate had a surface temperature of 390 to 400° F. An 8-in. square of the laminate to be drawn was placed on top of this asbestos and was covered by a slightly larger second sheet of heavy laminate. Satisfactory softening was obtained in 12 to 13 sec., and blistering would begin at about 15 seconds. When the material was softened, it was transferred promptly to the forming die.

It was found that a maximum elapsed time of 10 sec. could be allowed between the time the laminate was removed from the hot plate and the time the die closing was started. An expeditious method of handling the hot, limp laminate was required, since this 10 sec. included the time for locating and centering the laminate in the die as well as for transferring to the die. A satisfactory method consisted of sliding the hot laminate off the asbestos sheeting onto the piece of heavy laminate previously used as a cover, using the heavy plastic as a carrier to the die, and sliding the thin laminate off the carrier directly into position on the die.

Die temperature

Although most of the literature reports appearing previously have stated that cold dies were satisfactory, a very hot die was found to be required for this particular molding. This may have been necessary because the thin laminate would cool very rapidly. The main part of the die, consisting of all parts except the pressure ring and its pressure pins, rested on a platen maintained at 390 to 400° F. Between moldings, the pressure ring was frequently removed and was placed on a

* Ordnance Dept., Picatinny Arsenal, Plastics Laboratory, Dover, N. J.

[1] "Post-formed laminated phenolic plastics," by F. Sullivan, Metals & Alloys *21*, 392, 724 (Feb.–Mar. 1945).
[2] "Post-forming and its application," by B. Nash, MODERN PLASTICS *23*, 129–31 (Sept. 1945).
[3] "Phenolic laminated sheet for low pressure hot forming," Product Engineering *15*, 674–8 (Oct. 1944).
[4] "Post-formed laminates," (Abstract), by J. R. White, MODERN PLASTICS *22*, 129 (Mar. 1945).
[5] "Post-forming thermosetting products." H. J. Heinz Co. method for molding or post-forming phenol-formaldehyde laminated sheets, MODERN PLASTICS *20*, 70 (Aug. 1943).
[6] "Post-forming developments during the war and their applications to peacetime products," by W. I. Beach, India Rubber World *113*, 825–7 (Mar. 1946); same cond. Product Engineering *17*, 118–19 (Sept. 1946).
[7] "Thermo-elastic forming airplane parts from phenolic plastics." North American Aviation, Inc., by W. I. Beach, Machinery *50*, 182–7 (July 1944).
[8] "Thermo-elastic forming of laminates," by W. I. Beach, MODERN PLASTICS *22*, 132–5 (Nov. 1944).
[9] "Thermo-elastic forming of airplane parts," by W. I. Beach, Mechanical Engineering *65*, 719–23 (Oct. 1943).

1—A phenol-formaldehyde resin containing a plasticizer and/or a percentage of aniline-formaldehyde resin was used in laminating the plastic domes shown here. When a stiffer type of laminate was used, rips occurred at base

hot plate. In this manner the plunger of the die was maintained at 320 to 330° F. and the pressure ring at 290 to 310° F.

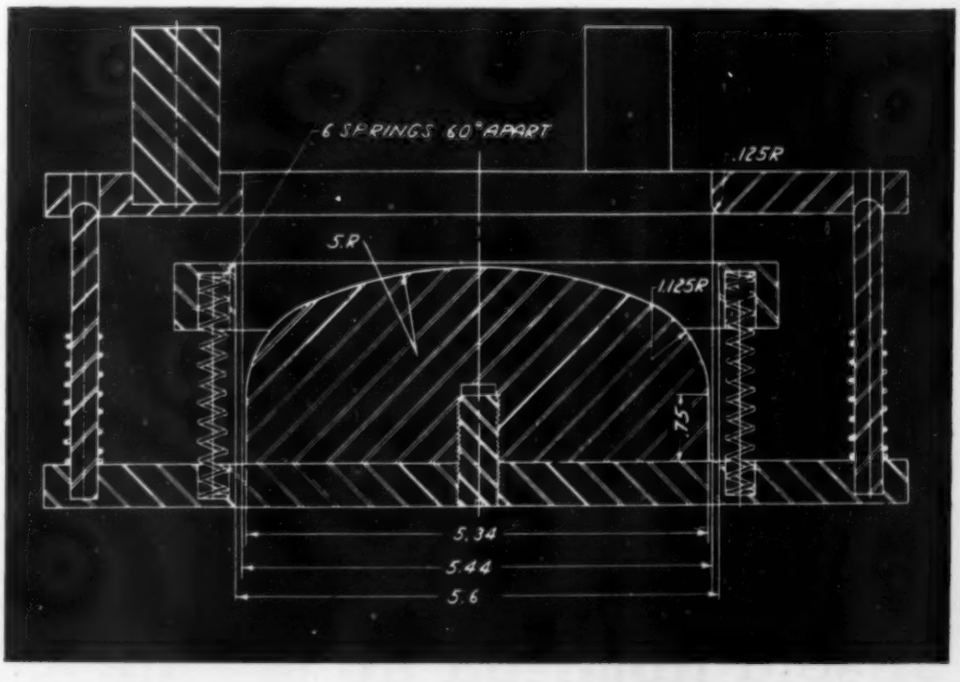
As soon as the laminate was located in the die, the die was closed at a uniform speed in 7 to 10 sec., 5 tons of pressure being applied in the fully closed position. A blast of compressed air was played on the formed dome for 20 sec., the die was opened, and the finished molding was removed. There was no detectable "spring back" or variation in dimensions of the finished part as compared with the actual dimensions of the die. Neither was there any measurable change in dimensions when the finished part was subsequently held for 1 hr. at 230 to 260° F.

Details of forming die

The forming die itself consisted of a base plate, plunger, restraining ring supported by springs, pressure ring with pressure pins, and guide pins to center the pressure ring relative to the plunger (Fig. 2). All parts except the springs were made from cold rolled steel. The contour of the plunger was made exactly to the desired inside contour of the finished part with no provision or allowance for "spring back" from the drawn dimensions. The springs supported the restraining ring at such a height that the top surface of the ring was $^1/_{16}$ in. higher than the highest part of the plunger. Thus a restraining force was exerted upon the laminate as soon as drawing commenced.

The springs were of such a stiffness that they exerted a total force of 240 lb. per in. of compression and, accordingly, the total force against the restraining ring was 420 lb. just before the die was fully closed. Springs which exerted a total load of only 120 lb. per in. of compression permitted the laminate to wrinkle during molding, and springs which exerted a total load of 420 lb. per in. of compression gripped the laminate so tightly that ripping was found to result before the draw was completed.

The restraining ring itself was made thick to prevent



2—Base plate, plunger, restraining ring supported by springs, pressure ring with pressure pins, and guide pins to center pressure ring are shown in this diagram of die used to form dome-shaped pieces (Fig. 1). All parts excepting the springs are made from cold rolled steel

3—Stiff as well as pliable types of post-forming laminates can be used in drawing cylindrical parts with nearly vertical walls. However, depth of drawing without tearing is less than in the case of the domed piece in Fig. 1

bending. This thickness also permitted a relatively deep counter-sink for the top end of the springs, resulting in increased sidewise support of the springs, which kept the springs from tipping over. This deep counter sink also permitted the use of springs with greater initial length, thereby increasing the ratio of closed spring length to open spring length and accordingly prolonging the life of the springs.

The heavy restraining ring also acted as the stop for termination of the draw and was therefore the dimensioning element which determined the depth of draw obtained.

The opening in the pressure plate was centered over the plunger by two guide pins supported in the base plate. Springs surrounding these guide pins lifted the pressure plate at the end of the drawing operation. The clearance between the pressure ring and the plunger was found to be one of the critical factors. Satisfactory clearance between the pressure ring and the plunger was between 0.012 and 0.025 in. all the way around (difference in diameter of 0.024 to 0.050 in.). Clearances which were too small resulted in cutting the laminate, and clearances which were too large permitted wrinkling at the dome base. The forming edge of the pressure ring had a radius of $^1/_8$ in. to avoid cutting the laminate.

Pressure was applied to the pressure ring through three pressure pins rather than being applied directly. This arrangement was used in order to provide space for the plunger to pass through the pressure ring.

Pressure needed appears to vary

A design providing for the use of six springs supporting the restraining ring was found to be very advantageous because the exact pressure required on the restraining ring appears to vary from part to part and from one type of laminate to another. Accordingly, it is difficult to predict the pressure required. If the die is designed to take six springs, this permits the use of three or six springs in symmetrical arrangement and allows variation in the pressure applied to the restraining ring by varying the number of springs as well as by varying the characteristics of each.

The dome-shaped piece described was made without vertical side walls in order to permit drawing as deeply as possible. The finished part had a maximum depth of $1^1/_2$ in. and a diameter of $5^1/_2$ inches. Cylindrical parts with vertical or nearly vertical side walls can also be drawn from either the stiffer or the more pliable types of post-forming laminates, but the depth of draw obtainable without tearing is less. A piece of this general shape is shown in Fig. 3. The die used for this drawing followed the same general design and principles as the die for the dome shaped piece.

Experience with oil-bath heating

Heating the laminate in an oil bath rather than on a hot plate has the advantage of closer temperature control and also of providing a lubricated surface to slip between the restraining ring and the pressure ring. Fisher's "Hydrogenated Bath Wax" held at a temperature of 445 to 465° F. raised the laminate to the proper temperatures in 6 to 7 seconds. The coating of wax on the laminate also seemed to retard the cooling of the laminate while being transferred to the drawing die.

The disadvantages of using a wax bath for heating are smokiness, fire hazard, necessity of cleaning wax from the finished piece, and the general messiness of the operation. Accordingly, the wax bath method was not employed in this molding and would not normally be used except where the utmost accuracy of temperature control was found to be required.

Aeknowledgment

The authors wish to express their thanks to Mr. E. O. Hausmann of the Continental Diamond Fibre Co., Mr. J. E. Mains of the National Vulcanized Fibre Co., and Messrs. H. J. Ballance and A. J. Bastian of the Westinghouse Electric Co. for providing technical information and for assisting in the procurement of material.

Baby "Sparkle Plenty" doll is manufactured by Ideal Novelty & Toy Co., New York City, and copyrighted by Chicago Tribune-News Syndicate, Inc.

— a good head for business — Doll-baby "Sparkle Plenty" has a head of tough, durable Tenite. It can be banged, washed, and caressed repeatedly without shattering, or nicking, or crazing, or dissolving into a pulp. It is painted with lacquers that have a chemical affinity with Tenite to make them long lasting. Sparkle Plenty's Tenite head is a joy to her little owner.

For the manufacturer, too, Tenite has decided advantages. It can be injection molded at the fastest speeds possible with plastics, making large-scale production economical. Parts can be cemented together rapidly in an enduring bond. Tenite easily withstands machining operations because of its great toughness. The doll's eye frame can be crimped right into the plastic.

Tenite is also suited to many other, unrelated products. Write for a new color-illustrated book on Tenite, its properties, uses, and manufacturing processes. TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

TENITE *an Eastman plastic*

From "Rags to Riches . . . IN STRENGTH"!

This 9½"x6" heavy-duty insulating block was molded to high-impact requirements thru the use of a Claremont rag-filled phenolic formulation. However tough the strength specification, it's easy for a Claremont Filler (flock, thread, fabric or cord) to fulfill the needs. Inquiries invited.

Insulating block shown molded of Durez #12052 with a Claremont rag filler — a plastic material compounded by Durez Plastics & Chemicals, Inc.

Photo, courtesy of molder, Norton Laboratories, Inc. of Lockport, New York.

CLAREMONT
FLOCK
THREAD
FABRIC
CORD

CLAREMONT

THE FILLER IS THE HEART

WASTE MANUFACTURING CO.

"The Country's Largest Manufacturer of Flock" CLAREMONT, N. H.

Mechanical tests of macerated fabric phenolic molding material*

by WILLIAM N. FINDLEY†

Results of mechanical tests of macerated fabric phenolic molding material are reported. The following tests were performed: Static tension, compression, torsion, and flexure tests; long-time creep tests at different stresses; tests for time to fracture under long-continued constant load; Izod and Charpy impact tests; bending fatigue tests at different ranges of stress; rotating beam fatigue tests at different speeds of testing; rotating beam fatigue tests of notched specimens; and torsion fatigue tests. The static tests were all made at the same rate of strain; and the results of the static tests include values of yield strength, ultimate strength, and modulus of elasticity in tension, compression, and shear (torsion). The effects of speed of testing on the results of the torsion test, of stress on creep, and of range of stress, speed of testing, notches, and different types of loadings on the fatigue strength are discussed.

THE TESTS reported herein were undertaken because of the fact that macerated fabric phenolic molding materials are being used in applications in which the load-resisting ability of the material is of importance. An example of such an application is the use of this material for aircraft antenna masts. In some of the applications in which this material is used it may be subjected to static loads, to repeated loads, and to impact. Static loads of long duration may result in distortion or fracture as a result of creep; repeated loads (vibration) may result in a progressive fracture (fatigue); impact may result in fracture if the energy-absorbing capacity of the material is too low. Thus it is evident that a knowledge of the ability of the material to withstand these various types of loading is necessary for a rational design of members and for proper selection of material for a specific application.

This investigation, conducted at the University of Illinois, was sponsored by and conducted with financial assistance from the National Advisory Committee for Aeronautics.[1]

Material

The macerated fabric phenolic molding material for these tests was supplied by the Plastics Div. of the Monsanto Chemical Co. It was made in their laboratories especially for these tests and was a special formulation as described below. The composition and treatment, however, are similar to Resinox 6542 and Resinox 6754. It is also equivalent to U. S. Navy type CFI-20, Bureau of Ships Ad Interim Specifications 17P4 (INT).

The molding composition contained 50% of a one-

* Abridged from N.A.C.A. Report ARR No. 3F19. The apparatus and test procedures are described in the original report and in the following articles in previous issues of MODERN PLASTICS:

"Effect of molding pressure and resin on results of short-time tests and fatigue tests of compreg," by W. N. Findley, W. J. Worley, and C. D. Kacalieff, MODERN PLASTICS 22, 143 (Aug. 1945).

"Short-time static tests and creep tests of a paper laminated plastic," by W. N. Findley and W. J. Worley, MODERN PLASTICS 22, 143 (June 1945).

"Creep characteristics of plastics," by W. N. Findley, MODERN PLASTICS 22, 153 (Dec. 1944).

"Relation between repeated impact and fatigue tests," by W. N. Findley and O. E. Hintz, Jr., MODERN PLASTICS 21, 119 (Dec. 1943).

See also the references in footnotes 2, 4, and 5.

† Associate in theoretical and applied mechanics, College of Engineering, University of Illinois, Urbana, Ill.

[1] The author wishes to express his gratitude to the National Advisory Committee for Aeronautics for its sponsorship of this program of tests, and to the Plastics Div. of the Monsanto Chemical Co. for the material supplied and for their cooperation in preparing a special formulation in order that complete data might be given regarding the composition of the material. Dr. H. K. Nason was instrumental in preparing this material. Acknowledgment is also made to the U. S. Regional Soy Bean Laboratory at the University of Illinois for the loan of certain air-conditioning and testing equipment.

These tests were a part of the work of the Engineering Experiment Station of the University of Illinois, Dean M. L. Enger, director, in the Dept. of Theoretical and Applied Mechanics of which F. B. Seely is head. The author is indebted to F. B. Seely and H. F. Moore for their suggestions and criticism during the conduct of these tests and the preparation of this paper. The fatigue tests reported in this paper were performed as part of senior theses by J. W. Lessner and W. J. Lindahl under the author's direction. The tension, compression, and torsion tests were a part of a senior thesis by B. J. Farrell performed under the author's direction. Credit is also due Otto Hintz, R. V. Chase, and W. J. Worley, student test assistants, for their careful work during the conduct of these tests.

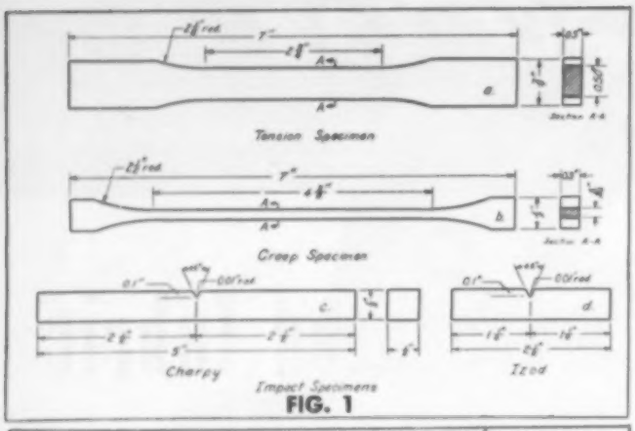


FIG. 1

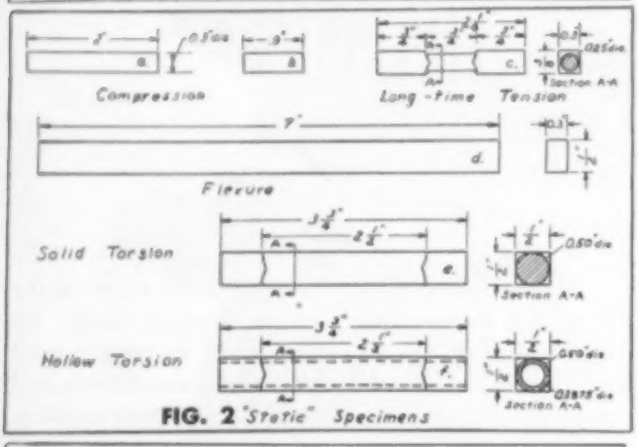


FIG. 2 "Static" Specimens

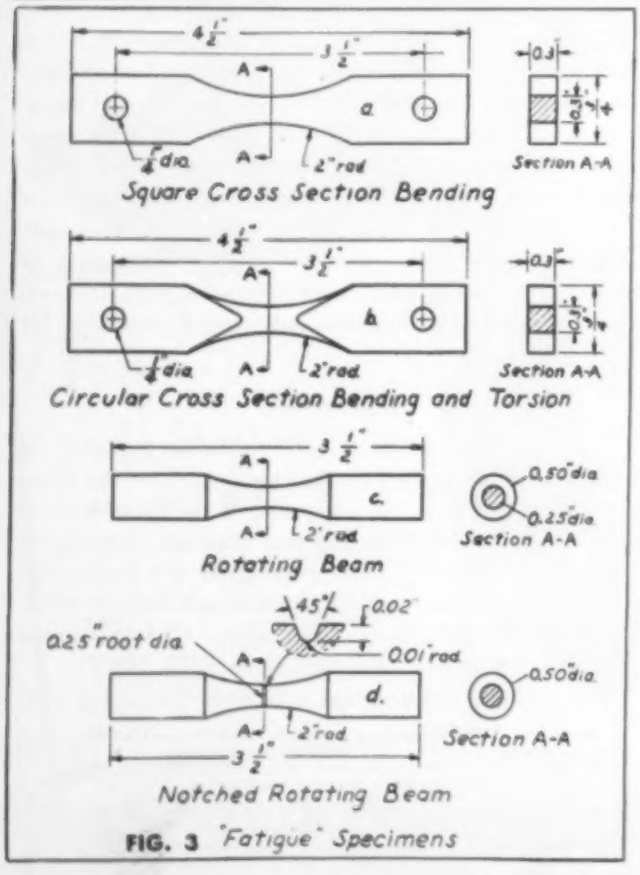


FIG. 3 "Fatigue" Specimens

1, 2 and 3—All specimens were machined to the dimensions indicated above by milling or turning and then smoothed with emery paper. All remained in air-conditioned laboratory for two weeks before testing.

stage phenol-formaldehyde resin and 50% of cotton denim and twill rag, cut in $^3/_4$-in. pieces. The "cabinet closing time" (a measure of plasticity) was 70 to 80 seconds. Two separate preforms were used per molded slab in order to obtain the required thicknesses.

Sheets 5 by 7 in. were molded of this material in two thicknesses, namely, 0.3 and 0.5 inch. The different thicknesses were used in order to accommodate the specimens mentioned below. The 0.5-in. slabs were molded for 35 min. and the 0.3-in. slabs for 15 min. at 170° C. and 7000 p.s.i.

Specimens

All tension, compression, flexure, creep, time to fracture, bending fatigue, and torsion fatigue specimens were made from sheets approximately 0.3 in. thick. The torsion, impact, and rotating-beam fatigue tests were made on specimens cut from sheets 0.5 in. thick. Tension, compression, torsion, flexure, time to fracture, and creep specimens were cut from the sheet with the axis of the specimen parallel to the 7-in. dimension of the sheet. All fatigue and impact specimens were cut with their axes parallel to the 5-in. dimension. In so far as possible all specimens for one group of tests were cut from one sheet. Where this was not possible the sheet numbers are indicated on the curves.

The specimens were machined to the dimensions shown in Figs. 1, 2, and 3 by milling or turning, as required, using sharp tools and such combinations of tool shape, speed, and feed as gave good finish and a minimum of heating of the specimen. After machining, all machined edges were smoothed with emery paper. A high polish was not possible because of the cloth filler.

All specimens were allowed to remain in the air-conditioned laboratory for at least two weeks after machining before the tests were started. All tests were carried out in a laboratory which was maintained at a constant temperature of 77°±1° F. and 50 ±2% relative humidity continuously through the tests. This was necessary because of the sensitivity of the material to small changes in temperature and relative humidity.

Static tension tests

The stress-strain curves for tension tests of the phenolic molding material are shown in Figs. 4A, B, C. Figure 5 shows the strain-time curve corresponding to the stress-strain curve of Fig. 4C. From these curves the following quantities were measured: yield strength at 0.05% offset (chosen because specimens occasionally fractured before any larger offset was reached), ultimate strength, ultimate strain, modulus of elasticity, and rate of strain. The values obtained for these quantities are tabulated in Table I for the five specimens tested.

The rate of strain was obtained as the slope of the strain-time curve in the region just before strain was no longer proportional to stress, that is, the slope of the diagonal line in Fig. 5. There was not a constant relation between the measured strain and the time. This curve may be approximately divided into three portions by the lines representing strains of 0.001 and 0.003 in./

inch. The first portion was curved, due probably to friction lag in the extensometer or perhaps also to slippage of the wedge grips or other readjustments of the machine under load; the second portion was approximately a straight line corresponding to the straight line portion of the stress-strain diagram; the third portion was curved. This was due to the fact that stress was not proportional to strain during this portion of the strain-time curve. As a result of this fact the load on the machine no longer increased at a constant rate, so that the machine no longer deflected as much for the same amount of motion of the loading screw. Therefore the *specimen* must stretch more in the same time interval. A stiffer testing machine would probably give a more nearly straight strain-time curve. The ratio of load to deflection under a tension load was 10,170 lb./in. for this machine.

The data shown in Table I were taken from specimens cut from two different 5 by 7-in. sheets. (The figures before the letter in the specimen number designate the number of the sheet.) An examination of these data and those for the impact tests in Table V (p. 220) shows that there was no marked difference in properties of different sheets.

The average deviation from the mean is also shown in Table I. It is a measure of the amount of scatter in the data. The small scatter evident in Table I is probably fortuitous since the results of other tests indicate a greater scatter, as might be expected with such a non-homogeneous material.

Static compression tests

The stress-strain curves for compression tests of specimens of the type in Fig. 2a are plotted in Figs. 6A, B, C, D (p. 148). Specimens 2 in. in length were used for these tests to permit the use of a compressometer having a 1-in. gage length. The data plotted in Fig. 6A were taken with a compressometer having a 1-to-1 lever ratio and a 0.0001 dial. This dial did not have sufficient travel to cover the entire range of strains, but was used to obtain data at the foot of the curve for use in determining the modulus of elasticity. The data plotted in Figs. 6B, C, D were obtained with a similar instrument equipped with a 0.001 dial so that strain readings could be taken to fracture.

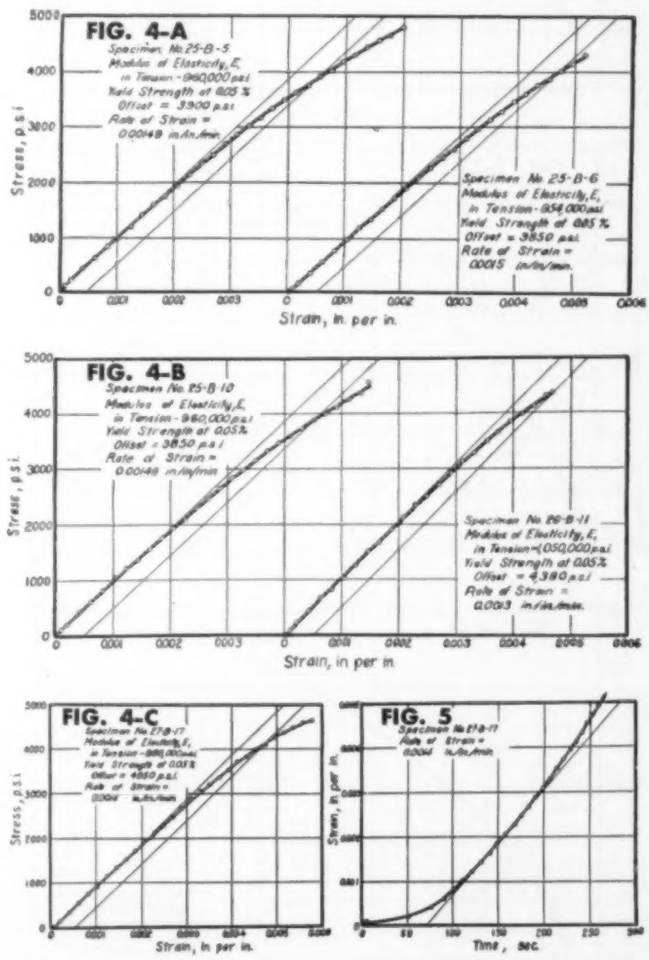
Table II (p. 148) summarizes data from all these curves and includes average values and average deviations from the mean. The average modulus of elasticity in compression was 886,000 p.s.i. There is about twice the spread in values of modulus for the compression tests as for the tension tests, and there is just as much spread between results obtained with the 0.0001 dial as with 0.001 dial. The average value of modulus obtained in compression is about 10% less than the average value obtained in tension.

The average value of yield strength at 0.05% offset was 4120 p.s.i., which is about 3% higher than the corresponding value in tension. The average yield strength at 0.2% offset was 6060 p.s.i. The average ultimate strength obtained in these tests was 13,200 p.s.i. This value was not considered representative because the length of the specimen was such as to permit buckling to occur before failure. There was, however, not suffi-

Table I.—Static Tensile Tests of Phenolic Molding Material[a]

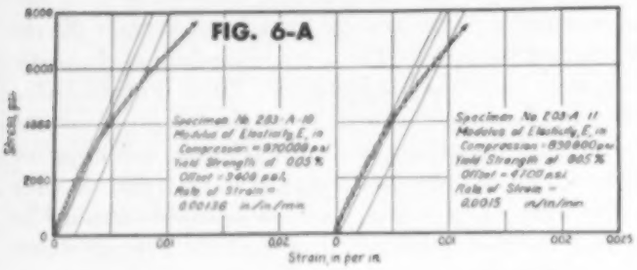
Specimen number	*Yield strength (0.05% offset)*	*Ultimate strength*	*Ultimate strain*	*Modulus of elasticity*	*Rate of strain*
	p.s.i.	*p.s.i.*	*in./in.*	*10^3 p.s.i.*	*in./in./min.*
25-B-5	3900	4790	0.00597	960	0.0015
25-B-6	3850	4320	0.00515	954	0.0015
25-B-10	3850	4550	0.00556	960	0.0015
26-B-11	4380	4430	0.00464	1050	0.0013
26-B-17	4050	4670	0.00577	980	0.0014
Average	4010	4550	0.00543	981	0.0014
Average deviation from the mean	170	140	0.00042	28	....

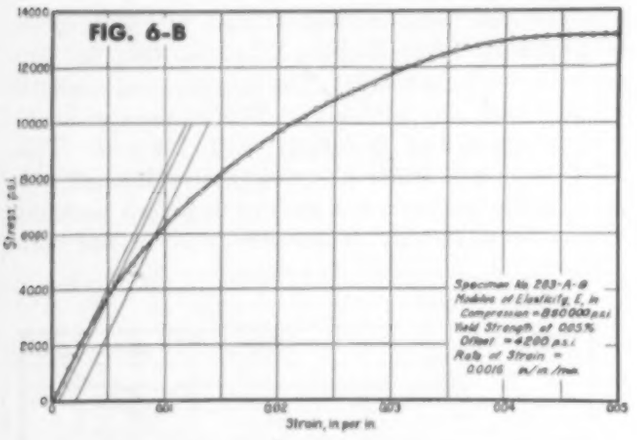
[a] Average no-load head speed was 0.040 in./minute. Test specimen shown in Fig. 1a.

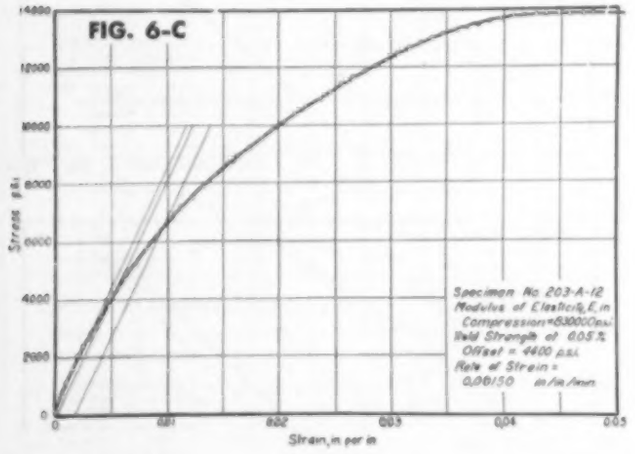


4A, B, C—Stress-strain curves for tension tests of the phenolic molding material. 5—Strain-time curve corresponding to stress-strain curve of Fig. 4C

6A, B, C, D—Stress-strain curves for compression tests of specimens of the type shown in Fig. 2A are plotted. Data in 6A were taken with a compressometer having a 1-to-1 lever ration and a 0.0001 dial; data for the others were obtained with a similar instrument which was equipped with a 0.001 dial







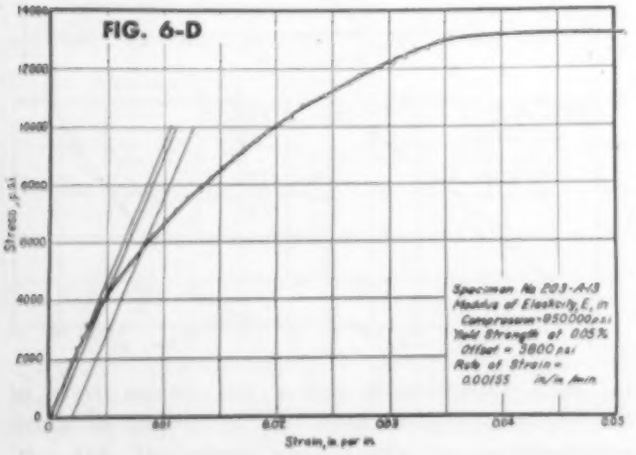


Table II.—Static Compression Tests of Phenolic Molding Material[a]

Specimen number	*Yield strength (0.05% offset)*	*Yield strength (0.2% offset)*	*Ultimate strength*	*Ultimate strain*	*Modulus of elasticity*	*Rate of strain*
	p.s.i.	*p.s.i.*	*p.s.i.*	*in./in.*	*10^3 p.s.i.*	*in./in./min.*
203-A-10	3400	5500	12,700	...	970	0.0014
203-A-11	4700	6700	13,000	...	830	0.0015
203-A-9	4200	5900	13,200	0.0497	850	0.0016
203-A-12	4400	6400	13,800	0.0508	830	0.0015
203-A-13	3900	5800	13,200	0.0508	950	0.0016
Average	4120	6060	13,200	0.0504	886	0.0015
Average deviation from the mean	380	390	260	0.0005	59	..

[a] Average no-load head speed was 0.0105 in./minute. Test specimen shown in Fig. 2a.

cient tendency for buckling to affect the values of yield strength reported above. Because of buckling, another set of shorter specimens, as shown in Fig. 2b, was tested. The results are tabulated in Table III. The average value of ultimate strength for these specimens was 18,960 p.s.i. which is about four times the ultimate strength in tension.

Figure 7 shows a sample strain-time curve with a diagonal line drawn to indicate the slope, corresponding to the elastic region of the stress-strain curve. The same characteristics are observed in this curve as in the tension strain-time curve, Fig. 5.

For purposes of comparison the rate of strain was made approximately equal in the tension and compression tests. It was 0.00015 in./in./min. (head speed of 0.0105 in./min.) for the "long" compression test. In the case of the short specimens the rate of strain was determined by comparing the load-time data, taken for these tests (not shown), with load-time data for the "long" specimens.

It will be noticed that the head speed for the compression tests was about one fourth head speed for the

Table III.—Static Compression Tests for Ultimate Strength of Phenolic Molding Material[a]

Specimen number	*Ultimate strength*	*Approximate rate of strain*
	p.s.i.	*in./in./min.*
203-A-5	18,560	0.0008
203-A-3	19,640	0.0008
203-A-2	19,640	0.0009
203-A-4	18,370	0.0015
203-A-6	18,610	0.0015
Average	18,960	...
Average deviation from the mean	540	...

[a] Test specimen shown in Fig. 2a.

Table IV.—Static Torsion Tests of Phenolic Molding Material[a]

Specimen number	Yield strength (0.05% offset)	Yield strength (0.2% offset)	Modulus of rupture	Ultimate strain	Shearing modulus (G)	Rate of strain	Tensile shearing
	p.s.i.	p.s.i.	p.s.i.	in./in.	10^3 p.s.i.	in./in./min.	
305-T-11	2500	3180	3180	0.0155	232	0.0012	0.0050
305-T-13	2420	3130	3160	0.0158	236	0.0012	0.0050
305-T-15	2730	3560	3640	0.0173	235	0.0014	0.0058
Average	2550	3290	3330	0.0162	234	...	...
Average deviation from the mean	120	180	210	0.0007	2	...	...

[a] Average no-load head speed was 0.024 rev./minute. Test specimen shown in Fig. 2e.

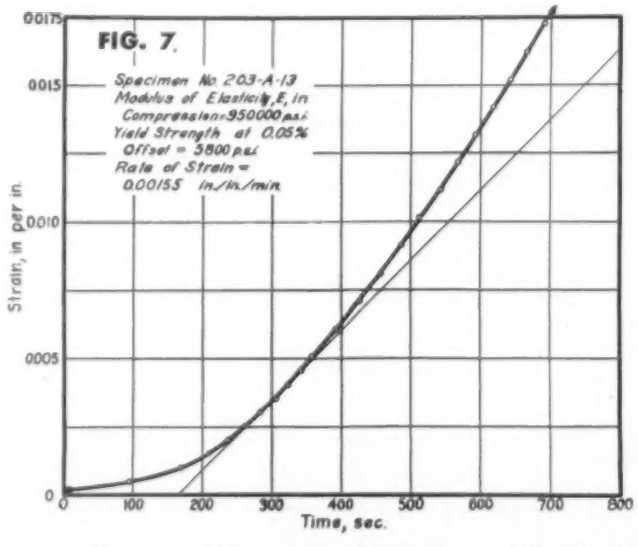
tension tests, although the rate of strain was the same and the machine was the same for both tests. This difference resulted largely from the difference in shape of the specimen and method of gripping the specimen. It is thus evident that care must be exercised in the selection of testing-machine speeds if results of tension and compression tests of plastics are to be comparable. This precaution is unnecessary with materials for which test data are not affected by changes in rate of strain.

Static torsion tests

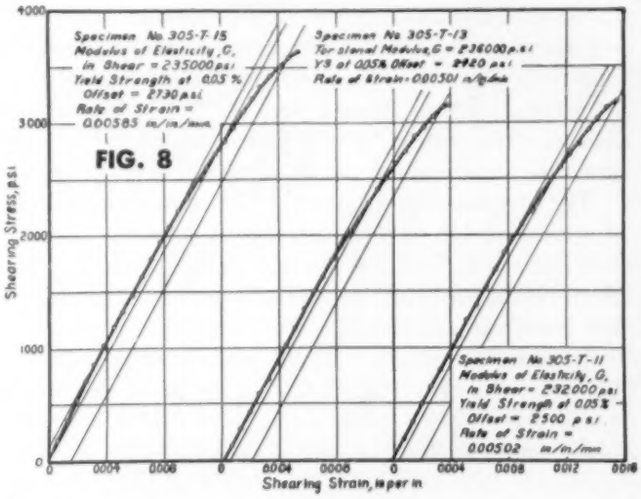
Shear stress-strain curves obtained in torsion tests of "solid" specimens (Fig. 2e) are shown in Fig. 8. The curves for the torsion tests are similar to those for the tension tests in that fracture occurred after a relatively small amount of strain. The last two curves show a straight-line stress-strain relation up to about 2000 p.s.i.; whereas the first curve in Fig. 8 indicates some deviation from linearity at the lower region. This was attributed to the fact that a spacing ring used in setting up the detrusion gage was accidentally left on, causing slight friction. From these curves values of modulus of elasticity in sheer, yield strength at 0.05% and 0.2% offset, and torsional modulus of rupture were obtained. These values are tabulated in Table IV.

The average value of yield strength at 0.05% offset was 2550 p.s.i. This is about 63% of the yield strength at 0.05% offset in tension and compression. The average yield strength at 0.2% offset was 3290 p.s.i., which is about the same percentage increase over the 0.05% offset as observed for the compression tests. The average modulus of rupture, 3330 p.s.i., is only slightly higher than the yield strength for 0.2% offset. The ultimate strain is about three times the ultimate strain in tension and about one third the ultimate strain in compression. The average modulus of elasticity in shear was 234,000 p.s.i., which is 25% of the average of tension and compression modulus.

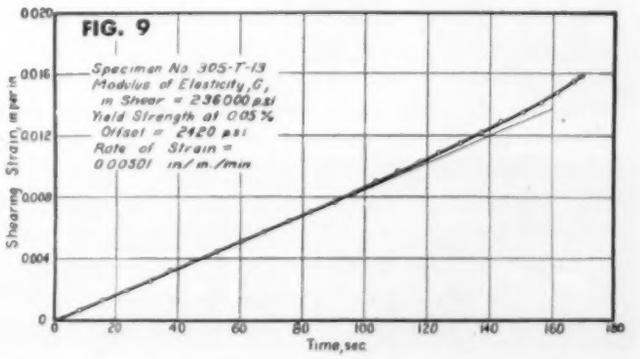
The shear rate of strain as shown in Table IV was obtained from strain-time curves, such as the curve shown in Fig. 9. The shearing strain-time curve does not show the first "stage" observed in the tension and compression tests; that is, there was no period of ad-



7—Sample strain-time curve with a diagonal line indicating the slope, corresponding to the elastic region of the stress-strain curve



8—Shear stress-strain curves obtained in torsion tests of "solid" specimens



9—Shearing strain-time curves of a "solid" specimen

justment required for the detrusion gage to overcome friction lag as was the case with the extensometer and compressometer. This was true because of the construction of the instrument which involved no frictional load on the measuring arms.

The rate of strain in tension which occurred during the torsion test was obtained from the known relationship that the maximum tensile stress equals the maximum shearing stress in a circular member subjected to torsion. From this fact the relationship between the rate of strain in tension and the rate of strain in shear was computed from the formula $\epsilon/t = (\gamma/l)\ (G/E)$, where ϵ/t is the tensile rate of strain; γ/t is the shearing rate of strain; and G/E the ratio of shearing modulus to tensile modulus. The tensile rate of strain in the torsion tests was approximately equal to the tensile rate of strain in both the tension test and the compression test. It was necessary to use the same rate of strain for comparative purposes because it was known that the rate of strain affected the values of yield strength, ultimate strength, modulus of rupture, and so forth (see Figs.10, 11, and the next paragraph).

Effect of speed of testing on torsion test

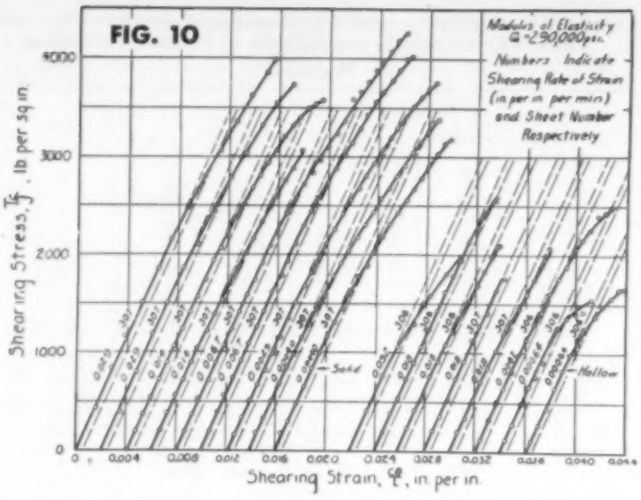
Torsion tests were performed at several speeds of testing to study the effect on the properties measured in the torsion tests. During these tests, readings of torque, angle of twist, and time were taken. From these data the shearing stress and shearing strain were computed. The shearing stress is plotted against shearing strain in Fig. 10 for tests of "solid" specimens at rates of strain from 0.0004 to 0.029 in./in./min. The shearing rate of strain was obtained in the same manner as described above.

The stress-strain diagram deviates from a straight-line relationship at a lower value of stress for the slow rates of strain than for the high rates of strain. This deviation is probably the effect of creep taking place at the lower rates of strain.

In order to obtain a better picture of the effect of changing the rate of strain on the results of the torsion tests, the shearing yield strength at 0.05% offset was obtained for each of the curves shown in Fig. 10. (The auxiliary line represents an offset of 0.05 percent.) The shearing yield strength is plotted against the shearing rate of strain in Fig. 11. The data reported for the torsion tests in Table IV are also plotted on this diagram. The shearing yield strength increases rapidly with increase of rate of strain at relatively low rates of strain. Above a rate of strain of about 0.01 in./in./min. the shearing yield strength is relatively little affected by further increase in rate of strain. This effect of rate of strain is similar in trend, but not in degree, to the effect of rate of strain on the tension test of cellulose acetate.[2]

Tests were also performed on hollow torsion specimens (Fig. 2f). The shearing stress obtained from tests of the hollow specimens is plotted against shearing

[2] "Mechanical tests of cellulose acetate," by W. N. Findley, Proc. A.S.T.M. 42, 914 (1942); MODERN PLASTICS 19, 71 (Aug. 1942).

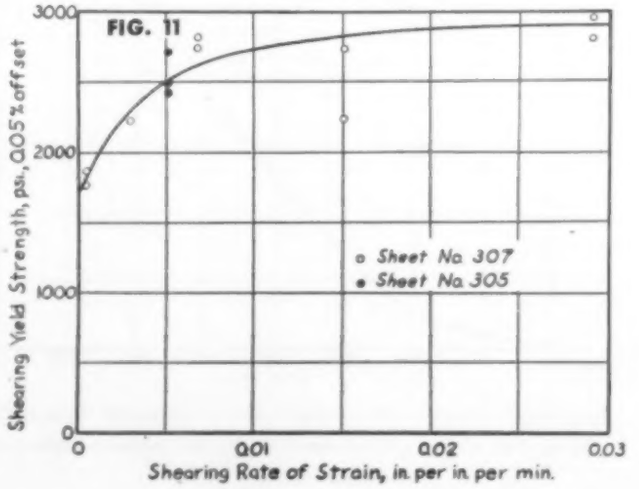


10—*Shearing stress plotted against shearing strain*

strain in Fig. 10. These tests were undertaken in an attempt to correlate the results of the torsion tests with the results of the tension tests of the same material. It was expected that the hollow torsion test would correlate much better than the solid torsion test, because the equation $\tau = (Tc)/J$ would yield a more accurate value of stress in the case of the hollow specimen than in the case of the solid specimen for values of stress near fracture. The average value of the maximum stress occurring in the hollow specimen was about 2000 p.s.i. or about one half of the tensile strength (see Table I). This may possibly be due to the fact that the fracture started at a position on the surface of the specimen which was originally at the interior of the sheet. Also, the tensile stress at the point of fracture was at an angle to the plane of the original sheet rather than parallel to the sheet as in the case of the tension test, so some strength difference might be expected.

The crack progressed along a helix, indicating that the significant stress causing fracture was probably a tension stress. Elementary theory shows that the maximum tension stress in (*Please turn to page 218*)

11—*Shearing yield strength plotted against shearing rate of strain*



"He cuts his costs—by using Fiberglas-Reinforced Plastics"*

Many alert designers and manufacturers are surprising their competitors and expanding markets by using Fiberglas Type 503 Mat (T-36), to lower costs in the construction of complete products or component parts. It provides the advantages of Fiberglas' unique combination of characteristics and can be used in either high or low-pressure laminating equipment . . . There are now fully developed production techniques which, in combination with low-cost Type 503 Mat (T-36), permit modern, high-speed production of reinforced plastics formed parts . . . If you are designing or manufacturing products which must have high tensile and impact strength, light weight, low moisture pickup and dimensional stability over a wide range of temperature and moisture changes, get complete information about Fiberglas-Reinforced Plastics now.

Let us send you a sample of Type 503 (T-36) and a copy of the new booklet describing the various other forms of Fiberglas plastics reinforcing materials. The quantity production process is also described and illustrated. Write: Owens-Corning Fiberglas Corporation, Dept. 876, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

OWENS-CORNING
FIBERGLAS
TM REG U.S. PAT. OFF.

FIBERS • MATS • CLOTHS

*FIBERGLAS is the trade mark (Reg. U. S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

Plastics Digest*

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publishers.

General

USE OF DIISOCYANATES TO MAKE WOOL UNSHRINKABLE. T. Barr, C. W. Capp, and J. B. Speakman. J. Soc. Dyers Colourists *62*, 338–45 (1946). The use of isocyanates to reduce the shrinkage of wool was investigated. Diisocyanates react with the absorbed water in the wool to give diamines. The residual diisocyanate and the diamine copolymerized to give a resinous deposit which coats the wool fiber. The best reagent is *m*-phenylene diisocyanate. Good results are obtained by treating the wool with 1% solutions of *m*-phenylene diisocyanate and hexamethylenediamine. Best results are obtained when the increase in weight of the wool is about 8% and then by heating for 1 hr. at 100° C.

CLASSIFICATION OF PLASTICS. H. Bouman, R. Houwink, and C. P. A. Kappelmeier. Oil Color Trades J. *110*, 634, 636 (1946). A classification system for plastics is suggested.

SYNTHETIC RESIN (AMINOPLASTIC) MOLDING MATERIALS AND MOLDINGS. British Standard 1322 (1946). Test methods and specification requirements for aminoplastic synthetic resin molding materials and moldings.

PROPERTIES AND APPLICATIONS OF UREA AND MELAMINE RESIN PRODUCTS. M. H. Bigelow and J. A. Murray. Product Eng. *18*, 140 (Aug. 1947). The types, molding techniques, properties, and design factors of urea- and melamine-formaldehyde molding compounds are discussed. Laminates, coatings, and adhesives made with urea and melamine formaldehyde resins are also considered.

FLAMEPROOFING OF TEXTILES. M. W. Sandholzer. National Bur. Standards Circ. *C455*, 20 pp. (1946). The principles of flameproofing textiles, together with a brief history, formulas, testing methods, and requirements are described.

CHEMICAL RESEARCH AGAIN SURGES UPWARD. Chem. Ind. *61*, 387–429 (Sept. 1947). New developments in chemicals and equipment are reviewed by specialists in each specific subject. Subjects of special interest to the plastics industry include synthetic organics, plastic materials and polymers, coal tar chemicals, cellulose, naval stores, dyes, polishes, industrial adhesives, chemicals from agriculture, leather chemicals, textile chemicals, rubber chemicals, protective coatings, and the various equipment sections.

FORMALDEHYDE PRESENTS A CHANGING ECONOMIC PICTURE. C. P. Neidig. Chem. Ind. *61*, 214–17 (Aug. 1947). The history, synthesis, grades, and uses of formaldehyde are discussed. The plastics industry is the largest user of this chemical.

Materials

PROPERTIES AND APPLICATIONS OF SILICONE RUBBER. E. M. Irish and J. R. Stirrat. Product Eng. *18*, 146–50 (Feb. 1947). The physical and chemical properties, and applications of four grades of silicone rubbers are reported. These materials are used as gaskets, seals, and press pads. They have excellent heat resistance up to 400° F., good low temperature flexibility and resilience down to −40° F., and excellent chemical resistance. Concentrated sulfuric acid is a solvent for all four grades at 77° F.

REACTION OF TETRACHLOROPHTHALIC ANHYDRIDE WITH CELLULOSE DERIVATIVES. W. P. Utermohlen, Jr., and E. L. Wallace. J. Polymer Sci. *2*, 275–80 (June 1947). Tetrachlorophthalic anhydride (TCPA) was reacted with cellulose diethyl ether in dioxane solution to produce esters with rather low tetrachlorophthalyl contents. Phthalic anhydride was found to be considerably more reactive than was TCPA with these cellulose derivatives, especially when pyridine was used as the reaction solvent. Acylations could not be executed with TCPA in the presence of pyridine as solvent, however, because this material decomposed the anhydride, removing the chlorine from it. The TCPA derivatives were more limited in solubility than were the corresponding esters made from phthalic anhydride.

GLASS FIBER REINFORCED PLASTICS. Product Eng. *18*, 160–5 (Mar. 1947). The construction, properties, and some applications of glass fiber reinforced plastics are described. In these laminates, advantage is taken of the high strength and light weight inherent in glass fibers. These fibers are used in the form of fabrics, fibers, and mats. By varying the amount of glass, the form, direction of ply and resin, the physical properties can be controlled over a wide range. Polyester and phenolic resins which cure at low pressures are preferred. The tensile strengths vary from 17,000 to 48,000 p.s.i., the compressive strengths from 20,000 to 39,000 p.s.i., the modulus of elasticity in flexure from 1.22×10^6 to 3.50×10^6 p.s.i. and the Izod impact strength from 15 to 31 ft.-lb./in. width. Specific gravities range from 1.46 to 1.84.

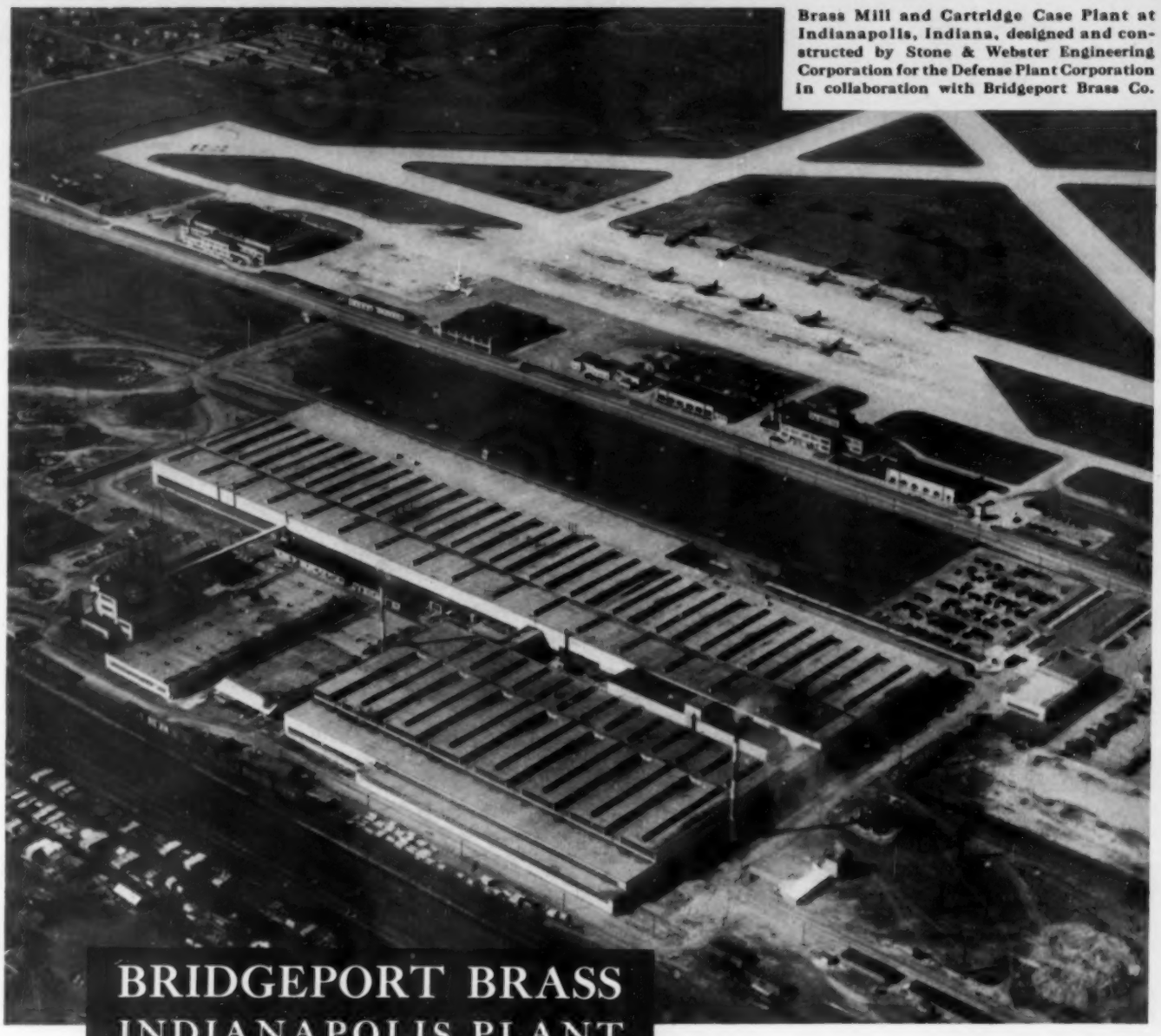
FLUORINATED STYRENES. G. B. Bachman and L. L. Lewis. J. Am. Chem. Soc. *69*, 2022–5 (Aug. 1947). The preparation of seven fluorinated styrenes, five of which are new, is described. The polymerization and copolymerization characteristics of these styrenes were studied.

DURESTOS. Plastics (London) *11*, 285–6, 313 (June 1947). A new type of molding material, consisting of asbestos felt filled with uncured phenolic resin, is described. The pieces of felt are precured by heating at 80° C. for from 2 hr. for fresh material to a few minutes for material 3 to 4 months old. Molding is done at 50 to 2000 p.s.i. at 145 to 180° C. Three grades are available. The properties of molded sheets of the materials are reported. The specific gravities are 1.65, 1.75, and 1.90.

Plasticizers

SULFONAMIDE PLASTICIZERS AND RESINS. H. S. Bergen, Jr., and J. K. Craver. Ind. Eng. Chem. *39*, 1082–7 (Sept. 1947). The sulfonamide plasticizers and resins are compatible with, and impart the desirable characteristics of gloss, toughness, and adhesion, to a wide variety of resins including cellulose nitrate, cellulose acetate, ethyl cellulose, nylon, and zein. Physical tests, including tensile strength, elongation, water permeability, and flexibility, were conducted on cellulose nitrate and cellulose acetate films and sheets plasticized with the sulfonamides and using dibutyl phthalate, camphor and dimethyl phthalate, and diethyl phthalate and triacetin as the respective control plasticizers. Tests were also conducted on injection molded specimens. In cellulose acetate, sulfonamide plasticizers impart greater flexibility and lower water permeability than the control plasticizers. The sulfonamide resins yield films of high tensile strength and extremely low water permeability. In cellulose nitrate the sulfonamides give films of greater tensile strength, elongation, and flexibility than

* Reg. U. S. Patent Office.



Brass Mill and Cartridge Case Plant at Indianapolis, Indiana, designed and constructed by Stone & Webster Engineering Corporation for the Defense Plant Corporation in collaboration with Bridgeport Brass Co.

BRIDGEPORT BRASS
INDIANAPOLIS PLANT

IN designing and constructing the Brass Mill and Cartridge Case Plant at Indianapolis, Stone & Webster Engineering Corporation collaborated with Bridgeport Brass Company engineers . . . Provision had to be made for the immediate and variable needs of wartime production . . . During the war it proved to be one of the lowest cost producers of cartridge brass in the country.

Today this efficient plant is again in operation as Bridgeport's mid-western brass mill. The shifting demands of peacetime production were met with a minimum of changes. It stands as an example of sound engineering . . . planned for future needs.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER INC.

the controls. The sulfonamide resins decrease water permeability, increase solvent resistance, and sharpen the melting point. Some applications of these plasticizers and resins in the paint, varnish, and plastics industries are discussed.

RHEOMETRY AS A METHOD FOR STUDYING THE MODE OF ACTION OF PLASTICIZERS. W. Scheele, M. Alfeis and I. Friedrich. Kolloid-Z. *108*, 44–58 (1944); Chem. Abstracts *40*, 7697–8 (Nov. 20, 1946). The work required to deform polystyrene decreases as the amount of plasticizer is increased. The temperature coefficient also decreases up to a critical concentration above which no further change is observed on the addition of more plasticizer. This is attributed to a change in the type of intermolecular cohesion. It is suggested that solvation occurs up to the critical point beyond which there is no further binding capacity. The plasticization of polyvinyl acetate was also investigated. The viscosities at temperatures from 20 to 95° C. for 49 plasticizers are reported.

NEW METHOD FOR THE EVALUATION OF SOLVENTS, PLASTICIZERS FOR POLYVINYL CHLORIDE. J. Delorme and R. Bluma. Plastiques *2*, 80–6 (1944); Chem. Abstracts *40*, 7699 (Nov. 20, 1946). Solvents for polyvinyl chloride are evaluated by measuring the specific viscosity at increasing temperatures of dilute solutions, 1.5 percent by weight. Smooth rising curves indicate gelling without separation of solvent. A break in the curve at a temperature above which viscosity decreases with rising temperature indicates separation of solvent from the gel. Increasing viscosity at higher temperatures shows agglomeration of globules of the gel. The results show that hydrocarbons, alcohols, ethers, acids, amines, amides and urethanes are not solvents for polyvinyl chloride. Chlorinated hydrocarbons and esters are partial solvents. Nitrohydrocarbons, aldehydes, ketones, and chlorinated ethers are good solvents.

Molding and fabricating

INFRARED HEATING IN SHAPING METHYL METHACRYLATE SHEET. Plastics (London) *11*, 309–13 (June 1947). The technique for heating methyl methacrylate plastic sheets with infrared lamps prior to shaping or forming is described in detail.

Applications

BREWING INDUSTRY LOOKS AT PLASTICS. J. D. Glenn. Plastics (London) *11*, 366 (July 1947). The use of plastics in the brewing industry and associated serving establishments is discussed. Laminates are used for decorative and constructional purposes; methyl methacrylate plastics are used in decorative and plumbing applications; phenolic plastics and polyethylene are used for coating metal containers to reduce metallic contamination and for piping.

PAPER OF HIGH WET STRENGTH. I. Bursztyn. Plastics (London) *11*, 287–92 (June 1947). The history of high wet strength paper and the use of urea- and melamine-formaldehyde resins in producing high wet strength papers is discussed. The compositions of various urea-formaldehyde resins used for this purpose, their application and the strengths of papers made with them are reported.

SYNTHETIC RESIN BEARINGS. F. W. Jones. Plastics (London) *11*, 367–71 (July 1947). The use of synthetic resin bearings in a British steel mill is discussed. Costs of installation and comparative operation costs of similar mills equipped with metal bearings are given. The plastic bearings are cheaper in cost but the mills had to be modified to use them. They are cheaper to replace and lubricate. The power consumption of mills equipped with plastic bearings is less than that of similar mills equipped with bronze bearings.

SYNTHETIC ADHESIVES FOR WOOD. K. Frey. British Plastics *19*, 303–11 (July 1947). This is a translation of an article in Schweizer Archiv, *13*, No. 3. The production, properties, technique for using, and applications of urea and melamine resin adhesives are discussed herein.

SARAN FILM 517. H. L. Schaefer and F. C. Dulmage, Jr. Modern Packaging *20*, 149–53 (July 1947). The properties of a new polyvinylidene chloride film are reported. The film is tasteless, odorless, and suitable for food packaging.

REGENERATED FIBERS FROM NATURAL POLYMERS. D. Entwistle. J. Soc. Dyers Colourists *62*, 261–71 (1946). The raw materials, manufacture, structure, and physical properties of regenerated fibers from natural polymers are reviewed. Fifty-four references.

Coatings

RESEARCH MAY DISCOVER BETTER COATING RESINS. Chem. Ind. *61*, 56–7 (July 1947). Resins used in flexible coatings are oil-modified alkyds, natural and synthetic rubbers, cellulose nitrate, and the various vinyl polymers and copolymers. The formulation and properties of each are discussed briefly. There are many other plastics with interesting properties but they are not sufficiently flexible. The ideal flexible coating resin is yet to be found.

RUBBER TO THE AID OF PAINTS AND PLASTICS. W. H. Stevens. Oil Colour Trades J. *110*, 845–6 (1946). The properties and applications of chlorinated rubber, cyclized rubber, oxidized rubbers, and synthetic hydrocarbon resins are reviewed in this article.

POLYMER FORMATION FROM NATURAL AND SYNTHETIC DRYING OILS. R. L. Terrill. Oil & Soap *23*, 339–44 (1946). The mechanism of the formation of polymers in the drying of natural and synthetic oils is discussed. Twenty-nine references.

INSTABILITY OF SOLUTIONS OF HIGH POLYMERS. J. A. Morrison, J. M. Holmes and R. McIntosh. Canadian J. Research *24B*, 179–91 (1946). The stability of solutions of polyvinyl acetate, polystyrene, and polymethyl methacrylate in bis(2-chloroethyl)ether, nitrobenzene and bis(2-chloroethyl)sulfide was investigated by following the changes in viscosity. Very small changes were observed when the dry pure polymers were dissolved in the pure solvents. Small amounts of impurities caused changes. Oxygen causes degradation and iron salts cause formation of gel structures.

PLASTIC-COATING INSIDE SURFACE OF DRILL PIPE TO COMBAT CORROSION-FATIGUE FAILURES. L. E. Trishman. Petroleum Engr. *18*, No. 2, 194–200 (1946). Petroleum drill pipe is coated on the inside with a thermosetting phenolic plastic to provide corrosion resistance.

WATER IMMERSION TESTING OF METAL PROTECTIVE PAINTS. W. Kittelberger and A. C. Elm. Ind. Eng. Chem. *39*, 876–81 (July 1947). The rate and the degree of water absorption of a paint system immersed in water or aqueous solutions are functions of the solute concentration gradient set up across the face of the coating. When an electrical potential gradient is superimposed upon a solute concentration gradient, both the rate and degree of water absorption are greatly increased. Over 90 percent of the total water absorbed by a linseed oil-type paint coating under the influence of both a concentration and a potential gradient, is transferred into the film by electroendosmotic forces. Experiments with synthetic resin paints are expected to show significantly lower ratios of electroendosmotic to osmotic effects. Measurements of the flow of electrical current accompanying this phenomenon suggest the possibility that the greater resistance to water absorption and blistering of some paint coatings is not so much due to a greater inherent waterproofness as to an appreciably higher electrolytic resistance. Since these tests were conducted with the same vehicle but with four different pigments, it seems reasonable to conclude that the phenomena described are functions of the pigments' properties used.

Here is new ease for a familiar chore. Proctor's new electric Never-Lift Iron . . . the "Iron that lifts itself" . . . has many comfort features, including the phenolic top-handle, designed to fit the contour of the hand.

PM
REG. U.S. PAT. OFF.

● Top handle transfer-molded by Plastic Manufacturers for Proctor Electric Company, Philadelphia.

PLASTIC MANUFACTURERS INCORPORATED • STAMFORD, CONN.

INJECTION • TRANSFER & COMPRESSION MOLDING • COMPLETE ASSEMBLY

Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

Engineering

COLUMN CHARACTERISTICS OF SANDWICH PANELS HAVING HONEYCOMB CORES. W. W. Troxell and H. C. Engel. J. Aeronautical Sci. *14*, 413–21 (July 1947). The column characteristics of panels having metal faces and honeycomb cores are reviewed. Compressive behavior is shown to be determined by the elastic properties of the face metal and by the shear rigidity of the stabilizing medium. A theory of column behavior, which considers the shear rigidity of the core and the reduced elastic properties of the face material at stresses above its elastic limit, is developed and shown to be in accord with experimental data. Optimum panel construction, i.e., the ratio of face thickness to total thickness, which yields the maximum strength-weight ratio is discussed and related to a loading parameter that measures the intensity of loading on the structure. Comparison of the structural efficiency of honeycomb panels with all-metal construction shows the sandwich to be the less efficient simple column. It is pointed out, however, that this comparison ignores the advantage of the transverse stiffness of the sandwich which comes into play in square panels or in those that are relatively long parallel to the direction of loading and narrow transversely.

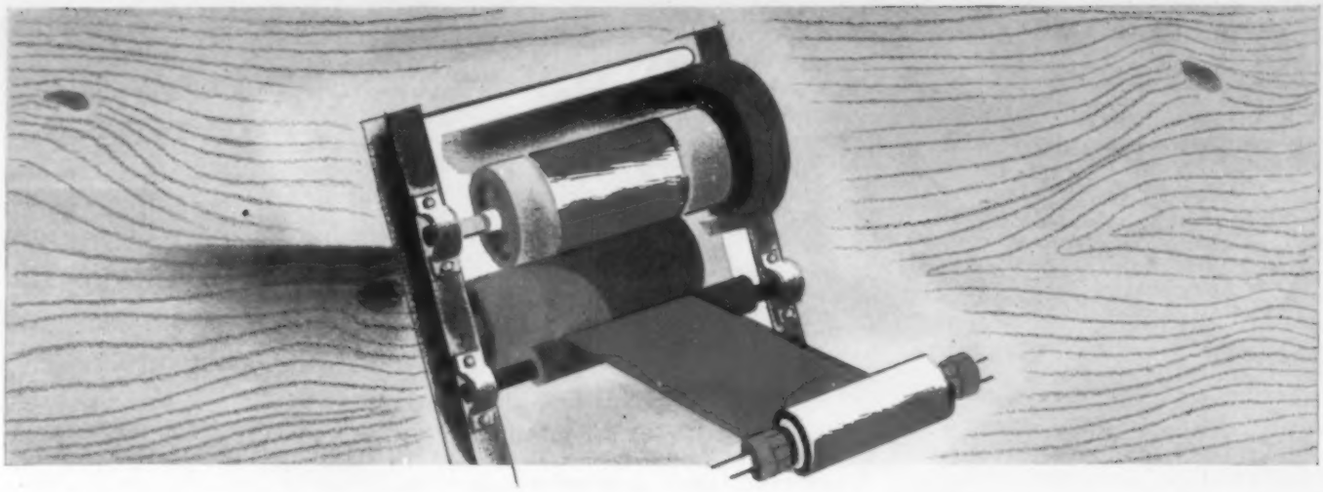
Chemistry

VELOCITY CONSTANTS OF THE PROPAGATION AND TERMINATION STEPS IN POLYMERIZATION REACTIONS. J. H. Baxendale and M. G. Evans. Trans. Faraday Soc. *43*, 210–17 (Apr. 1947). The temperature independent factors of the chain propagation and chain termination steps in polymerization reactions are discussed. Experiments show that in the case of vinyl acetate, A_p for chain propagation and A_t for chain termination are independent of chain length and that $A_p/A_t = 10^{-4}$. These results are discussed on the basis of the transition state method and the partition functions of long chain molecules in solution. In the partition function a distinction is made between the behavior of free monomer units and monomer units incorporated in the polymer chain. The temperature independent factors for reactions involving insoluble polymer chains are discussed in terms of the coagulation of colloidal particles. The influence of emulsifying agents on the velocity constant for chain termination is described as the effect of emulsifying agents on the charge of colloidal particles and hence on the rate of coagulation. Under these conditions the viscosity and hence the activation energy of viscous flow enter into the reaction constant for the chain termination reaction.

A GENERAL THEORY OF THE MECHANISM OF EMULSION POLYMERIZATION. W. D. Harkins. J. Am. Chem. Soc. *69*, 1428–44 (June 1947). A new general theory of the mechanism of emulsion polymerization is presented. It is shown that there are two types of loci: *A*, in which minute polymer particles are initiated; and *B*, in which most of the polymer is formed. *A*. Early in the reaction nearly all of the polymer particle nuclei are formed in monomers solubilized in the core of oil in the soap micelle. The polymer molecules thus formed grow from the soap micelle into the aqueous phase, the soap of the micelle becoming adsorbed soap. This locus ceases to be active at a yield of about 13 to 20 percent, when 5 percent as much soap as monomer is present initially; at lower yields with less soap and higher yields with more soap. The secondary locus for initiation is the aqueous phase, the relative importance of which rises with decrease in the initial amount of soap. This remains effective to some extent up to a yield which with the standard formula (5 g. soap to 100 g. monomer) is about 60 percent (32 percent with 10 g. soap), above which all of the monomer is dissolved in the polymer, except a very slight amount of monomer dissolved in the water. *B*. The locus in which nearly all of the polymer is formed is the polymer particles themselves. These take up monomer molecules from the aqueous phase and the monomer in the polymer-monomer particles thus formed undergo polymerization, while simultaneously the particles take up more monomer. This is the history of the particle, whether it is initiated in a soap micelle or in the aqueous phase. Commonly each polymer-monomer particle contains only one growing chain only a part of the time. According to the theory, an increase in the ratio of initial soap to monomer increases the relative amount of micellar material and should therefore increase the number of polymer particle nuclei formed early in the reaction per unit time. This should increase the number of polymer particles present at any given yield, and thus the rate of the reaction, and should therefore decrease the size of the particles. These predictions are in accord with the experimental results. Evidence is presented which seems to indicate: 1) Each double layer of soap is an independent micelle, whereas the earlier theory considers the micelle as a pile of double layers. 2) The micelle seems to increase in size with increase of soap concentration. 3) In agreement that the origin of the micelle is the decrease of free energy which accompanies the removal of the hydrocarbon chain from the water, the critical concentration for micelle formation is found to increase by a factor of 2 for each decrease by unity in the number of carbon atoms in the soap molecule. The principal function of the monomer emulsion droplets is not to serve as a primary locus for the formation of polymer, but as a storehouse from which monomer molecules diffuse into the aqueous phase where they are trapped by soap micelles and polymer particles in both of which they polymerize.

ALFIN CATALYSTS. A. A. Morton, E. E. Magat and R. L. Letsinger. J. Am. Chem. Soc. *69*, 950–61 (Apr. 1947). Diisopropyl ether reacts with amylsodium to give sodium isopropoxide and allylsodium which form a complex that causes the catalytic polymerization of butadiene and isoprene, rather than the formation of a series of adducts. Similar agents can be made from sodium alkoxides of methylalkyl carbinols and from metalated olefins. The reagents are called alfin catalysts because a secondary alcohol and an olefin enter into their preparation. These catalysts are unique because the intrinsic viscosities of the polymers produced therewith are dependent on the components of the catalyst but independent of the monomer-catalyst ratio. The testing of the catalyst and the general character of the polymerization reactions are described. A cyclic formula is suggested for the catalyst complex.

SOLUBILITY OF CELLULOSE IN MIXTURES OF NITROGEN TETROXIDE WITH ORGANIC COMPOUNDS. W. F. Fowler, Jr., C. C. Unruh, P. A. McGee and W. O. Kenyon. J. Am. Chem. Soc. 69, 1636–40 (July 1947). A novel type of cellulose solvent or peptizing agent is described which involves the use of a mixture of liquid nitrogen tetroxide and a second (organic) substance miscible with or soluble in this oxide of nitrogen. The second substance must contain an electronegative group in the molecule and exhibit very slow reactivity or none with



Widely favored for high strength paper laminates—

decorative laminates—

plastic-faced plywood

NO. 5013 PLYOPHEN

Using only 32% to 35% resin with high strength papers under pressures of 150 to 250 psi, unusually high degrees of tensile strength may be obtained in paper laminates. No. 5013 works well as a low-pressure bonding agent with other papers and canvas, and can be used in bag molding at pressures as low as 50 psi. It is also increasingly favored for the production of plastic-faced plywood. A working sample may be secured by writing direct to the Sales Department at Detroit.

REICHHOLD CHEMICALS, INC.

General Offices and Main Plant, Detroit 20, Michigan

Other Plants: Brooklyn, New York • Elizabeth, New Jersey • South San Francisco, California • Seattle, Washington • Tuscaloosa, Alabama
Liverpool, England • Paris, France • Sydney, Australia • Zurich, Switzerland • Milan, Italy • Rio de Janeiro, Brazil

SYNTHETIC RESINS • CHEMICAL COLORS • PHENOLIC PLASTICS • INDUSTRIAL CHEMICALS

nitrogen tetroxide as well as a useful range of miscibility or solubility with the latter. Such addends to nitrogen tetroxide include nitroparaffins, certain aromatic nitro compounds, sulfones, nitriles, aryl sulfonates, diaryl ketones, and aromatic, aliphatic and aromatic-aliphatic esters, as well as many others. The effect of such solvent mixtures on the properties of cellulose regenerated therefrom is described; oxidation is extremely slow. Several theories are discussed which might be used to explain these phenomena.

Properties

EXTRUSION PROPERTIES OF HIGH POLYMERS WITH INCLUDED CRYSTALLINE FILLER. J. H. Greenblatt and D. Fensom. Ind. Eng. Chem. *39*, 1037–42 (Aug. 1947). The rate of flow-stress curves for three types of crystalline filler in several high polymer materials were determined with an experimental extrusion press as a viscometer. The fillers were purified sand, nitramine and nitrate. The high polymers were cellulose nitrates with a nitrogen content of 12.2 percent, polyvinyl acetate and polyisobutylene. The plasticizers were a condensed dibutyl sebacate and dibutyl phthalate. With one exception, the high polymer systems studied exhibited exponential-type flow with pressure. A low viscosity cellulose nitrate plasticized with dibutyl sebacate exhibited plastic flow. Addition of crystalline filler to the high polymers above 50 percent by weight caused a rapid increase in the apparent viscosity and tended to emphasize the exponential shape of the flow curves. Fine fillers gave the greatest increase in apparent yield point and in apparent viscosity, and the closest approach to theoretical density. Anomalous low viscosities obtained with the nitramine and nitrate fillers in cellulose nitrate and dibutyl sebacate gave indication of the presence of a surface-active phenomenon around the filler particles. With increase of filler content the viscous volume of the flow segment tended to decrease in size, and the amount of decrease was in order of increasing molecular weight of the polymer. It also appeared from the relative change in viscous volume that the real resistance to flow on addition of filler was in the fluid phase.

SURFACE ELECTRICAL CONDUCTANCE OF DIELECTRICS. N. N. Semenov and N. M. Chirkov. Compt. rend. acad. sci. U.R.S.S. *51*, 39–42 (1946); Chem. Abstracts *40*, 6909 (Nov. 20, 1946). The surface conductivity of mica, glass, methyl methacrylate resin, polystyrene and polyisobutylene were measured in a vacuum and in the presence of acid, alkali and various concentrations of water vapor. None of the materials have any surface conductivity in vacuum regardless of whether or not there is acid or alkali on the surface. Methyl methacrylate resin, mica and polystyrene show no surface conductivity in the presence of distilled water vapor up to saturation. Minute traces of acids in the water vapor at high pressures produce surface conductivity. The higher the water vapor pressure, the greater the conductivity; the surface conductivity is dependent on the relative humidity and not the absolute vapor pressure.

Testing

INSTRUMENT FOR MEASURING PARTICLE DIAMETERS AND CONSTRUCTING HISTOGRAMS FROM ELECTRON MICROGRAPHS. E. E. Hanson and J. H. Daniel. J. Applied Phys. *18*, 439–43 (May 1947). An instrument for shortening the time and labor required in constructing particle size histograms from electron micrographs is described. Representative histograms obtained with the instrument for GR–S latices are shown. Linear, surface and volume-equivalent diameters of nonspherical particles are defined and variations in the instrument for plotting such diameters are proposed.

A SOUND VELOCITY METHOD FOR DETERMINATION OF MOLECULAR WEIGHT OF LIQUID POLYMERS. A. Weissler, J. W. Fitzgerald and I. Resnick. J. Applied Phys. *18*, 434–8 (May 1947). A new method is presented for determining number average molecular weights of liquid polymers, by means of easily performed measurements. The molecular weight is an explicit function of the sound velocity, density, refractive index and two empirical constants. Accuracy of about 2 parts per 100 was attained for the lower polyethylene glycols. The method seems suitable for molecula weights up to several thousand. Soun velocities were measured by an acous interferometer, at a frequency of one megacycle.

APPROXIMATE SOLUTION OF THE DIFFERENTIAL EQUATION OF THE ULTRACENTRIFUGE. W. J. Archibald. J. Applied Phys. *18*, 362–7 (Apr. 1947). In determining molecular weights with the ultracentrifuge by the equilibrium method, it is necessary to drive the rotor at relatively high speeds for very long periods of time. It would be a real advantage to be able to deduce molecular weights from the distribution of concentration within a cell placed in a rotor without waiting for equilibrium. The solution of a certain differential equation gives the theoretical distribution within the cell at any time, and a comparison of the experimentally determined concentrations with those deduced from theory should yield molecular weights without waiting for equilibrium. The exact solution of this differential equation is known, but it is not suitable for numerical work. An approximate solution from which numerical results can be obtained with ease is presented.

Synthetic rubber

EFFECTS OF IMPURITIES ON COPOLYMERIZATION OF BUTADIENE AND STYRENE. R. L. Frank, J. R. Blegen, G. E. Inskeep and P. V. Smith. Ind. Eng. Chem. *39*, 893–5 (July 1947). Nineteen possible impurities in butadiene and styrene were added in varying amounts to mixtures of butadiene and styrene, and their effects on polymerization rates of the mixtures were determined. In amounts of 1 percent or less of the monomers used, the following appear to have no effect in emulsion polymerization: ethylbenzene, *o*-xylene, phenylacetylene, methylphenylcarbinol, acetophenone, acetaldehyde, propylene, allene, isoprene and ethylacetylene. The butenes and straight-chain pentenes show some retardation at 1 percent. At higher percentages these compounds cause a marked decrease in conversion. Polymer conversions are lowered sharply by 1,4-pentadiene and less markedly by 1-vinyl-Δ^3-cyclohexene. *p*-Divinylbenzene and vinylacetylene (1 percent) have little or no effect on the polymerization rates, but they do cause cross linking in the polymers.

EFFECTS OF IMPURITIES ON COPOLYMERIZATION OF ISOPRENE AND STYRENE. R. L. Frank, C. E. Adams, J. R. Blegen, R. Deanin and P. V. Smith. Ind. Eng. Chem. *39*, 887–93 (July 1947). The presence of traces of impurities in commercial isoprene obtained from petroleum has a profound influence on the qualities of the isoprene for polymerization purposes. Of these impurities the paraffins, cycloparaffins, and simple acetylenes have little or no effect. The mono-olefins, for the most part, have a slight retarding influence on polymerization rate in emulsion. Certain olefins, however, having the structural unit $\rangle C{=}\overset{|}{C}CH\langle$, have a substantially larger retarding effect than the others. This includes such compounds as 3-methyl-1-butene, isoprene dimer and 1,3-pentadiene dimer. Other impurities which cause substantial retardation are 1,3-pentadiene, vinylacetylene and carbon disulfide. Extreme retardation is caused by 1,4-pentadiene, cyclopentadiene and lower mercaptans. In general, the greater the retardation the lower the intrinsic viscosity of the polymers obtained. Of the impurities tested, only vinylacetylene appeared to cause cross linking. The mode of action of these retarders is briefly discussed in this article.

U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each.

EXTRUSION APPARATUS. D. N. Davies and F. H. Churchman (to Cellomold Ltd.). U. S. 2,422,953, June 24. A process for extruding a thermosetting resinous composition which remains only transiently deformable after extrusion.

DECORATIVE PRODUCTS. R. I. Johns. U. S. 2,422,969, June 24. A decorative material including a backing, a number of cylindrical glass members which are thin and flexible, but of sufficient rigidity normally to retain a rectilinear form, the backing having applied to one side thereof a solution in a vaporizable solvent of a water-resistant plastic substance of the type to produce a transparent body on drying, the members being arranged in the applied substance, while still in the presence of the solvent, so that portions of the members contiguous to the substance are wetted thereby, the members being arranged in side-by-side relationship and in close proximity to each other, and a coating of said substance applied over the members as arranged on the backing, said coating being in sufficient volume to penetrate between members and consolidate with the substance as it was originally applied to the backing.

ALGINATES. E. E. Tallis (to Courtaulds Ltd.). U. S. 2,422,993, June 24. Alginate threads are prepared by extruding a solution of sodium alginate through a multihole jet into a coagulating bath consisting of water, calcium chloride, cetyl pyridinium chloride and acetic acid.

LAMINATES. D. D. Adams and K. Rollius (to Old King Cole, Inc.). U. S. 2,422,998, June 24. A shaped laminated paper article is prepared by cutting a plurality of flat plies of corrugated paper into a predetermined pattern, applying plastic adhesive to certain surfaces, superposing said plies with the adhesive coated surfaces abutting each other, die-forming said superposed plies simultaneously into a channel shaped contour, curved transversely to the direction of the corrugations, by slippage of the plies one upon the other, and maintaining the plies in said contour until the plastic adhesive has set.

MIXED ESTER POLYMERS. I. E. Muskat (to Marco Chemicals, Inc.). U. S. 2,423,042, June 24. The polymerizable mixed ester of an alpha, beta polycarboxylic acid, phthalic acid, and ethylene glycol.

ALGINATE THREADS. R. B. Hall (to Courtaulds Ltd.). U. S. 2,423,075, June 24. Alginate threads are prepared by extruding, in the absence of oil, an aqueous solution of an alkali alginate into an oil-free coagulating bath containing an aqueous solution of a salt of an alkaline earth metal, a mineral acid, and a cationic, non-ionogenic wetting agent, passing the thread in the form of helices onto thread-advancing device, and treating with a neutral aqueous solution containing an alkaline earth metal salt and a wetting agent.

HELMETS. Le G. Daly. U. S. 2,423,076, July 1. A helmet is prepared from plastic treated fabric by assembling flat pieces in helmet form and molding together to the desired shape.

SUBSTITUTED ACRYLIC RESINS. E. M. Filachione and C. H. Fisher (to United States of America). U. S. 2,423,089, July 1. Aryl acrylates are prepared by pyrolyzing the corresponding aryl ester of alpha-acetoxypropionic acid at a temperature of 400 to 600° C.

POLYESTERS. C. J. Frosch (to Bell Telephone Laboratories, Inc.). U. S. 2,423,093, July 1. An ethylene glycol isopropylene glycol sebacic acid aconitic acid polyester.

FURANE RESIN. J. Delmonte (to E. F. Lougee and R. Hemphill). U. S. 2,423,139, July 1. In the process of making chlorinated furane resins, the step of adding chlorine to a furfural-containing liquid in the presence of caustic alkali.

CASTING. R. J. Miller (to Miller Engineering Corp.). U. S. 2,423,151, July 1. A temperature control mold for casting resinous material.

COATED NAIL. W. E. Boak (to American Steel and Wire Co.). U. S. 2,423,171, July 1. A metal fastening such as a nail is coated with a composition comprising "fine melt" congo resin, run gilsonite, and plasticizer.

COLD-DRAWN FILAMENTS. R. T. Fields (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,423,182, July 1. The process comprising subjecting to tension a cold-drawn organic polymeric filament, having recurring tapered units uniformly disposed lengthwise, while passing between draw points spaced at least five times the length of a tapered unit in drawn condition, and heating the filament to a temperature between 40 to 100° C.

COATING. W. Gundel and E. Gotte (to Hydronaphthene Corp.). U. S. 2,423,185, July 1. A process for producing an improved coated and impregnated material comprising impregnating at 50° C. with an aqueous solution of a water-soluble salt of a basic amine-aldehyde resin composed of the condensate of formaldehyde with dicyandiamide and with a preformed mineral acid salt of guanyl urea and after the solution is removed, converting the resin to its water-insoluble state by removing the water solubilizing acid groups of the resin.

COATING. G. E. Eilerman (to Pittsburgh Plate Glass Co.). U. S. 2,423,230, July 1. A resin composition capable of forming a non-skinning emulsion in water is prepared by neutralizing with sodium silicate and ammonia the adduct of maleic anhydride and a glyceride drying oil, the anhydride rings of said adduct being opened before neutralization.

HEAT SEALING. A. B. Haslacher. U. S. 2,423,237, July 1. Hermetic heat seals are formed by superimposing predetermined areas of flexible sheet material directing a current of warm gas against at least one exterior surface, the velocity of said current being sufficiently high so that its component normal to the exterior will exert an impact pressure sufficient to seal said meeting surfaces.

EXTRUDED TUBING. C. E. Slaughter (to Extruded Plastics, Inc.). U. S. 2,423,260, July 1. In an apparatus for the fabrication of rigid tubing by drawing operations from die extruded hot resinous thermoplastic, in combination a preliminary draw plate and final draw means spaced therefrom to give the exact external shape desired in the finished tubing, said draw means including a plate having a pressure exerting face which contacts a portion only of the tube periphery and thereby exerts shaping pressure against only a portion of the periphery.

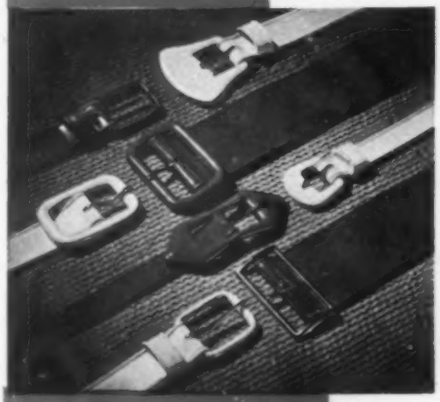
TEXTILE PRETREATMENT. J. D. Pollard (to American Cyanamid Co.). U. S. 2,423,428–9, July 1. The bonding properties of cellulosic or non-cellulosic textiles are improved by impregnating with an acidic aqueous colloidal solution of melamine-formaldehyde resin in a solvent comprising a water-soluble polyhydric alcohol and retaining 0.01 to 2.0

AVAILABLE NOW!

Increased production facilities for ELASTRON*

ELASTRON material is ideal for shoe uppers, trimmings, baby harnesses, handbags, luggage, etc.

Our SUPPLEX † garden hose which is being sold through retail outlets throughout the country, is made of ELASTRON.



We make the finished ELASTRON belts you see on the counters of retail stores. Our finished belts are made with electronic equipment which eliminates sewing.

If your line requires a large quantity production of extruded plastics of different widths, textures and thicknesses for high-quality items, it will pay you to investigate ELASTRON. For ELASTRON is the flexible polyvinyl plastic that we compound and extrude in widths up to 12" for a variety of consumer items. • ELASTRON does not crack, chip, peel or rot and resists rough usage. It is available in a wide variety of colors, transparent, translucent and opaque. It is inert to alcohol, oil, acids and resists freezing cold or hot sun. ELASTRON is made in high gloss patent, satin, smooth dull, coarse and fine grain. • ELASTRON extrusions eliminate finishing operations because they can be produced with crowned or beaded edges. That's why ELASTRON is ideal for so many different applications such as watch straps, shoe uppers, belts, luggage straps, suspenders, shoe trimmings, handbags, garden hose, furniture webbing, appliance bumpers, etc. • Investigate the advantages of utilizing ELASTRON in your products.

ELASTRON*

*Reg. U.S. Pat. Off. †TM Reg. Pend.

INDUSTRIAL SYNTHETICS CORPORATION

Our New Address 225 North Avenue Garwood, New Jersey

percent of resin on the textile in a water-insoluble condition.

PHOTOGRAPHIC ELEMENTS. D. M. McQueen (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,423,460, July 8. A color-yielding element comprising a support bearing at least one layer composed of a hydrophilic polyamide dye intermediate having dye intermediate nuclei attached to recurring nitrogen atoms in the polyamide chain, and having a light-sensitive silver halide dispersed therethrough.

LENS MOUNTING. M. N. Fairbank (to Polaroid Corp.). U. S. 2,423,491–2, July 8. In a mounting for a plastic lens, a housing of a material having a coefficient of expansion substantially different from that of the lens, a sleeve of a plastic having a coefficient of the same order as that of the lens and within which the lens is mounted, and means for securing the lens in the housing.

COMPOSITE SHEET. E. H. Land, J. Mahler, and W. H. Ryan (to Polaroid Corp.). U. S. 2,423,503, July 8. A composite plastic sheet comprising a layer of non-hydrophilic transparent plastic, a layer comprising hydrophilic material integrally formed on one surface of the first layer by regeneration of the material thereof, and a layer comprising molecularly oriented polyvinyl alcohol bonded to said regenerated surface layer.

LIGHT POLARIZER. E. H. Land and D. P. Cooper (to Polaroid Corp.). U. S. 2,423,504, July 8. Dichroic images are produced by converting a silver image into an insoluble silver salt image, converting the latter into a compound containing releasable iodine, treating the last image with an agent adapted to release free iodine therefrom and pressing said image evenly against a molecularly oriented sheet comprising a light-transmitting polyvinyl oxy compound to transfer the said iodine from the said image to the said sheet.

PHOTOPOLYMERIZATION. L. M. Richards (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,423,520, July 8. A process for preparing polymers comprising irradiating with light of wavelengths in the range from 2500 to 5000 Å a compound having only one terminal vinyl group and that activated by direct attachment to a different negative group such as a carbonyl, nitrile, acetylene, ether, or aryl group; and an N-substituted dithiocarbamic acid ester of an aliphatic alcohol, the irradiation being of sufficient intensity and employed for a time sufficient to yield substantial polymerization.

COATED PAPER. C. D. Ender (to Hercules Powder Co.). U. S. 2,423,555, July 8. A method for applying to paper extremely thin coatings of chlorinated rubber impervious to moisture and most oils, comprising applying to a moving continuous web of paper, a viscous composition comprising chlorinated rubber, plasticizer, wax, resin, and solvent, the latter being in a quantity such that the non-volatile content is 40 to 80 percent, drawing out the composition by pressure of a doctor against the moving paper, while resiliently supported, to a continuous coating and drying.

POLYVINYL ACETAL. E. A. Rodman (to E. I du Pont de Nemours & Co., Inc.). U. S. 2,423,565, July 8. Polyvinyl butyral resins are rendered insoluble by mixing with a butanol-modified urea-formaldehyde resin and thereafter heating at a temperature from 82 to 116° C. for at least 1 hr. until two contiguous films thereof are non-adhesive when placed under a 1 lb. weight for 30 min. at 82° C.

SURFACE HARDENING. D. P. Cooper (to Polaroid Corp.). U. S. 2,423,583, July 8. A plastic lens comprising a cellulose plastic, the surfaces of which are coated with and the layers thereof immediately adjacent said surfaces having diffused therethrough a polymerized mixture of allyl methacrylate, methyl methacrylate, and methacrylic acid.

COMPRESSED WOOD. J. E. Gurvitch (to Engineering & Research Corp.) U. S. 2,423,647, July 8. Laminated wood articles such as propellers are prepared by forming a plurality of wood veneers each having the approximate shape of one of the laminations of the final article but being of substantially greater dimensions throughout than one of the laminations, superposing said pieces in face-to-face relationship with adhesive between adjacent plies, and subjecting to fluid pressure over its entire external surface to reduce the size of the article in all directions, and heating the fluid to set the adhesive.

GEL-POINT INDICATOR. H. I. Davis and D. E. Farwell (to Eastman Kodak Co.). U. S. 2,423,687, July 8. An apparatus for determining the gel-point of cellulose derivative solutions which undergo gelation upon cooling comprising a rotary member immersed in a liquid solution.

STRIP CUTTING. R. L. Hallman (to J. W. Hallman). U. S. 2,423,698, July 8. An apparatus for cutting a strip of plastic material into pieces of desired size as the strip is fed continuously.

PROPELLER BLADES. G. W. Hardy (to Marquette Metal Products Co.). U. S. 2,423,700, July 8. A propeller blade comprising a central slotted metallic reinforcing bar tapering outwardly to a tip at one end, a perforated sheet metal reinforcing element mounted in the slot, a molded core of organic plastic material surrounding the bar and locked thereto by interlocking engagement with the perforations of said element, and a protective metallic armor bonded direct to said plastic.

PHOTOGRAPHIC ELEMENTS. P. R. Austin (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,423,749, July 8. A flexible photographic film comprising a transparent flexible support composed of orientable polyvinyl fluoride which has a softening point above 150° C. having superposed thereon a layer of polyvinyl acetate, a sublayer of gelatin and a gelatino-silver halide emulsion layer.

DRYING-OIL POLYMERS. I. M. Bernstein (to H. D. Roosen Co., Inc.). U. S. 2,423,751, July 8. Polymeric fractions of heat-polymerized drying oil are separated by extracting successively with progressively higher homologs of a saturated primary alcohol.

RUBBER TO METAL BONDS. J. D. Calfee and D. W. Young (to Standard Oil Development Co.). U. S. 2,423,755, July 8. A structure comprising a base solid, a resin body attached thereto and adhesive film therebetween comprising a cyclicized polymethylpentadiene.

CELLULOSE ESTER-POLYESTERS. W. O. Baker (to Bell Telephone Laboratories, Inc.). U. S. 2,423,823, July 15. A composition comprising an intimate homogeneous mixture of cellulose acetate butyrate and a synthetic linear polyester produced by condensing a polymerizable monohydroxy monocarboxylic acid with a mixture of glycols and dicarboxylic acids.

COMPOSITE STRUCTURE. G. W. Blessing (to Radio Corp. of America). U. S. 2,423,869–70, July 15. The method of uniting parts into a composite structure comprising placing a thermoplastic resinous material between said parts, subjecting the parts to pressure, and heating to partially pyrolyze the resinous material while under pressure.

CORROSION-RESISTANT COATING. O. P. Clipper (to Libbey-Owens-Ford Glass Co.). U. S. 2,423,872, July 15. A coating composition capable of producing a corrosion-resistant coating for cartridge cases comprising an alkoxy-substituted urea-formaldehyde condensate and an extracted pine wood pitch characterized by substantial insolubility in petroleum hydrocarbons.

CELLULOSE DERIVATIVES. J. W. Fisher (to British Celanese Ltd.). U. S. 2,423,883, July 15. Cellulose derivatives are prepared by esterifying cellulose ethers at temperatures up to 50° C. with anhydrides of organic carboxylic acids in the presence of metal halides and a hydrogen halide as catalyst.

MOLDING MACHINE. G. W. Wacker (to Clearing Machine Corp.). U. S. 2,423,914, July 15. An injection

molding machine for molding plasticized thermoplastic material.

METHOD FOR PACKAGING MOLDING MATERIAL. G. W. Wacker (to Clearing Machine Corp.). U. S. 2,423,915, July 15. A method of heating and packaging molding material comprising placing an electric conductor closure element in a non-conductive cylindrical chamber to close the bottom of the chamber, placing a predetermined quantity of molding material in said chamber, applying an electrical conductor closure element to close the top of the chamber, applying electrodes to said closure and supplying high frequency current to the electrodes to heat the material, and finally forcing the heated material and the closure elements out of the chamber into a container.

SHUTTLE. P. B. Wilson (to H. D. Wdgamot). U. S. 2,423,917, July 15. A loom shuttle having a body portion molded of plastic material and having wear strips of a different material affixed to the upper and lower edges and having their ends projecting into the body portion.

POLYVINYL ACETAL. D. S. Kaltreider (to Monsanto Chemical Co.). U. S. 2,423,981, July 15. A composition comprising a polyvinyl acetal resin, a plasticizer therefor, and an organic amide of an acid having less than four carbon atoms and an amine having more than 13, but less than 19 carbon atoms.

PLASTIC MASSES. H. I. Gilbert. U. S. 2,424,026, July 15. As a plastic mass, an inter-condensate of mixed natural resin acid chlorides and fatty acid chlorides, said condensate having a marked resistance to alkali.

TALL OIL ESTER RESIN. F. A. Bent and E. A. Peterson (to Shell Development Co.). U. S. 2,424,074, July 15. A tall oil ester resin prepared by heating tall oil with a polymerized ester of a carboxylic acid and an aliphatic unsaturated monohydric alcohol containing an olefinic linkage between the beta and gamma carbon atoms.

POLYVINYL ACETATE. G. O. Morrison and T. P. G. Shaw (to Shawinigan Chemical Ltd.). U. S. 2,424,110, July 15. A container of sheet cellulosic material bonded by a fused layer of a partially hydrolyzed polyvinyl acetate resin.

ILLUMINATED BLOCKS. A. S. Hoffman (to Howard Sales Co.). U. S. 2,424,169, July 15. A toy comprising a transparent plastic base having a longitudinal row of openings in its upper face wherein blocks bearing indicia may be positioned so as to be reflected upon a screen.

INJECTION MOLD. H. G. Hoffer (to Teksun Inc.). U. S. 2,424,235, July 22. An interchangeable split mold device for the injection molding of ophthalmic lenses from thermoplastic materials.

ARTIFICIAL LIMB SOCKET. P. W. Kunkel. U. S. 2,424,278, July 22. The method of forming sockets for artificial limbs comprising forming an encompassing molding band the bore of which conforms generally to the terminal portion of the limb and to which the limb is to be secured, applying a coating of plastic material to the bore, plasticizing the external face of the coating, applying pressure to the terminal portion of the limb to simulate operating stresses upon the coating and thus to form an impression in the coating and casting a permanent socket.

PIGMENT FIXATION. H. C. Olpin, S. A. Gibson, and W. C. McKnight (to British Celanese Ltd.). U. S. 2,424,284, July 22. A process for fixing pigments on textile materials, ribbons or films of cellulose acetate which comprises impregnating the material with an aqueous solution of a solid acid of ionization constant of not less than 10^{-4}, drying the impregnated material so that it retains the acid, applying the pigment in the form of a paste containing a water soluble condensate of an aldehyde with an amino triazine and heating the materials so as to effect the conversion of the water-soluble condensate to a water-insoluble condensate.

FABRIC TUBE. C. S. Hyatt and H. H. Brooks (to Columbus Coated Fabrics Corp.). U. S. 2,424,315, July 22. A fabric tube that includes a pair of fabric strips, each having a fluid impervious thermoplastic resin coating on one side to effect a liquid seal with the coatings placed in face engagement with one another and with an edge of each extending beyond a corresponding edge of the opposite strip.

PHENOLIC–PROTEIN PLASTIC. F. E. Calvert (to Drackett Co.). U. S. 2,424,383, July 22. Thermosetting plastic compositions suitable for use in continuous extrusion or injection processes and capable of hardening to an infusible and insoluble form by low temperature heating and without pressure are prepared by heating a mixture of 500 parts of a phenol such as phenol or cresol with 400 to 2000 parts of 40% formaldehyde and a basic catalyst to form a water-soluble casting syrup, acidifying and mixing with 500 to 750 parts of a protein dispersible in mild alkaline solution.

TEXTILE COATING. R. H. Czeczowitzka (to Texproof Ltd.). U. S. 2,424,386, July 22. A method of forming a surface coating of a polyvinyl resin on a textile fabric, comprising impregnating the fabric with water containing calcium alginate, ammonia, and a wetting agent, applying to the fabric a coating of a solution in an organic solvent of a plasticized polyvinyl resin and stearic acid, applying a coating of a solution containing a filler and a plasticized polyvinyl resin and drying the fabric.

VARNISH EMULSIONS. G. B. Heijmer. U. S. 2,424,458, July 22. Water-in-oil emulsions, the continuous phase of which comprises a tall oil resin or a fraction of tall oil resin, a film-forming vehicle containing a drying oil and water-insoluble organic solvents, the discontinuous phase consisting of water.

WOUND TUBING. B. Bogoslowsky. U. S. 2,424,540, July 29. An apparatus for making convolute wound tubing from sheet material, said tubing being bonded by means of a heat-sealing thermoplastic.

HEAT SEALING. W. R. P. Delano (to American Viscose Corp.). U. S. 2,424,558, July 29. In an apparatus for heat-sealing thermoplastic sheeting to itself or to other materials, the combination of a rotatable roller, means for heating said roller, and a seamless tubing of non-fibrous hydrophilic material fixed to the arcuate surface of said roller.

PACKING. R. M. Hill (to Armstrong Cork Co.). U. S. 2,424,567, July 29. A composite packing such as a cup washer or the like which is made of a layer of an artificial plastic composition which has some elasticity and which includes a body material which will swell when in contact with a solvent without disintegrating and which will be exposed to the action of such a solvent when in use, a second layer having substantially the same physical characteristics, but less tendency to swell, and an extraneous binder inert to the solvent.

THIOPHENE INTERPOLYMERS. R. C. Hansford (to Socony-Vacuum Oil Co., Inc.). U. S. 2,424,691, July 29. Product of reacting thiophene and a vinyl ester in the presence of boron trifluoride.

COATING. L. Balassa (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,424,730, July 29. A pigmented coating comprising a vehicle containing a resin such as an alkyd or a phenol-formaldehyde resin modified with a drying fatty oil, a pigment, litharge, and calcium hydrate.

TEXTILE. A. H. Davis. U. S. 2,424,743, July 29. A composite textile strand comprising at least one inorganic fiber and discrete elements of an organic plastic composition covering a portion only of the surface of said fiber and projecting therefrom to a greater effective diameter in the strand than said inorganic fiber.

PHENOLIC MOLDING COMPOSITION. W. H. Adams, Jr. (to Haveg Corp.). U. S. 2,424,787, July 29. A heat-convertible molding composition comprising a coagulated plastic capable of being directly molded under heat and pressure is prepared by mixing a one-stage phenol-formaldehyde resin, containing water, with a dry alkaline or alkali oxide

Plastics Stock Molds*

SHEET ONE HUNDRED FIFTY-SIX

Bathroom and household accessories in plastics help the housewife by providing neat, clean, convenient places for things. Soap and toothbrush go in the dish or boxes, and may be more easily carried. The reel provides a handy, compact clothesline.

1802. Robe hook with two size hooks.

1803. Single robe hook.

1804. All-purpose ring hanger.

1805. Soap box to accommodate large cakes of soap. It has a ridged bottom and ventilation holes.

1806. Paper holder.

1807. Paper holder.

1808. Tumbler.

1809. Soap dish.

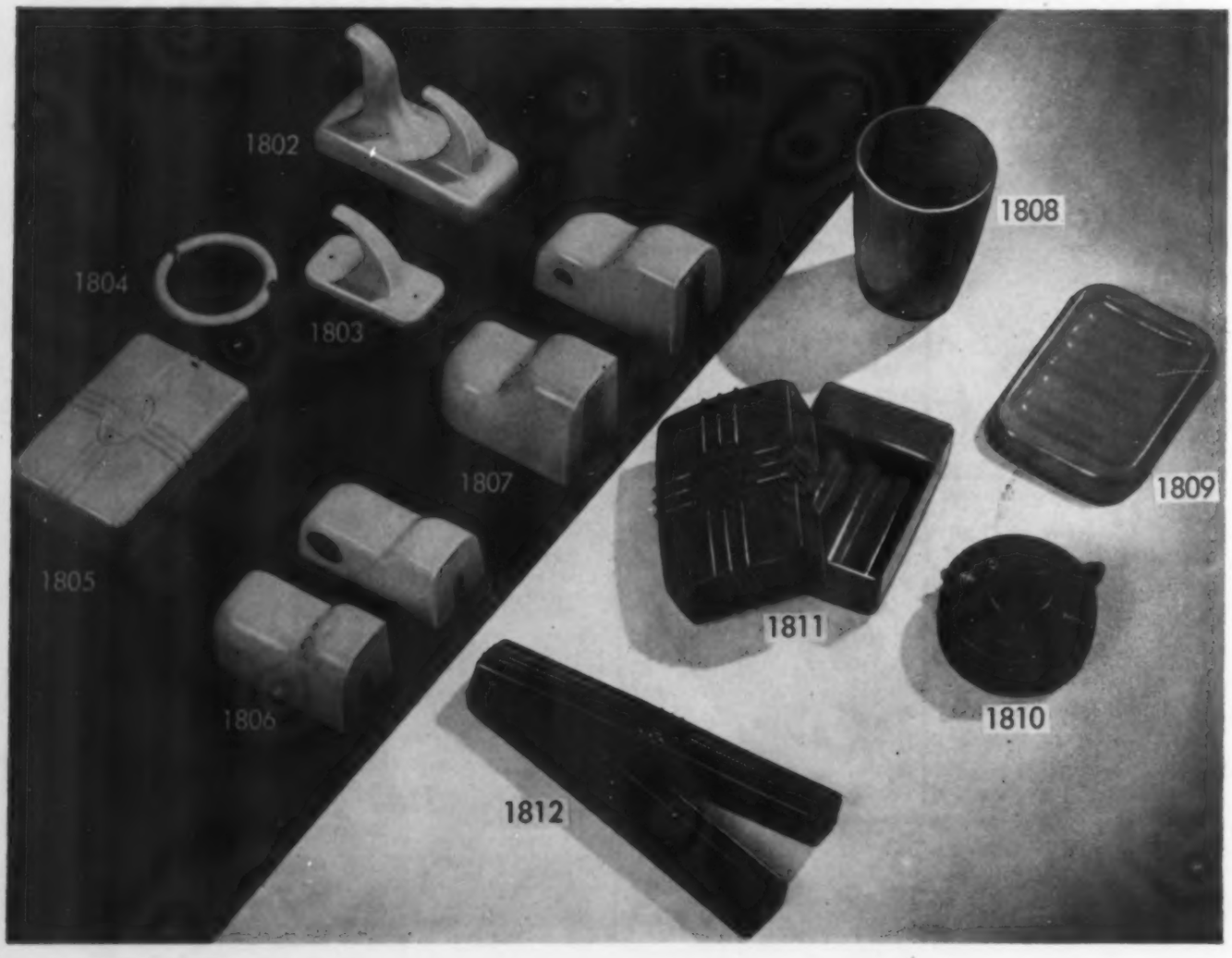
1810. Utility reel clothesline with 28 ft. of line, hooking hole, and wedge hook.

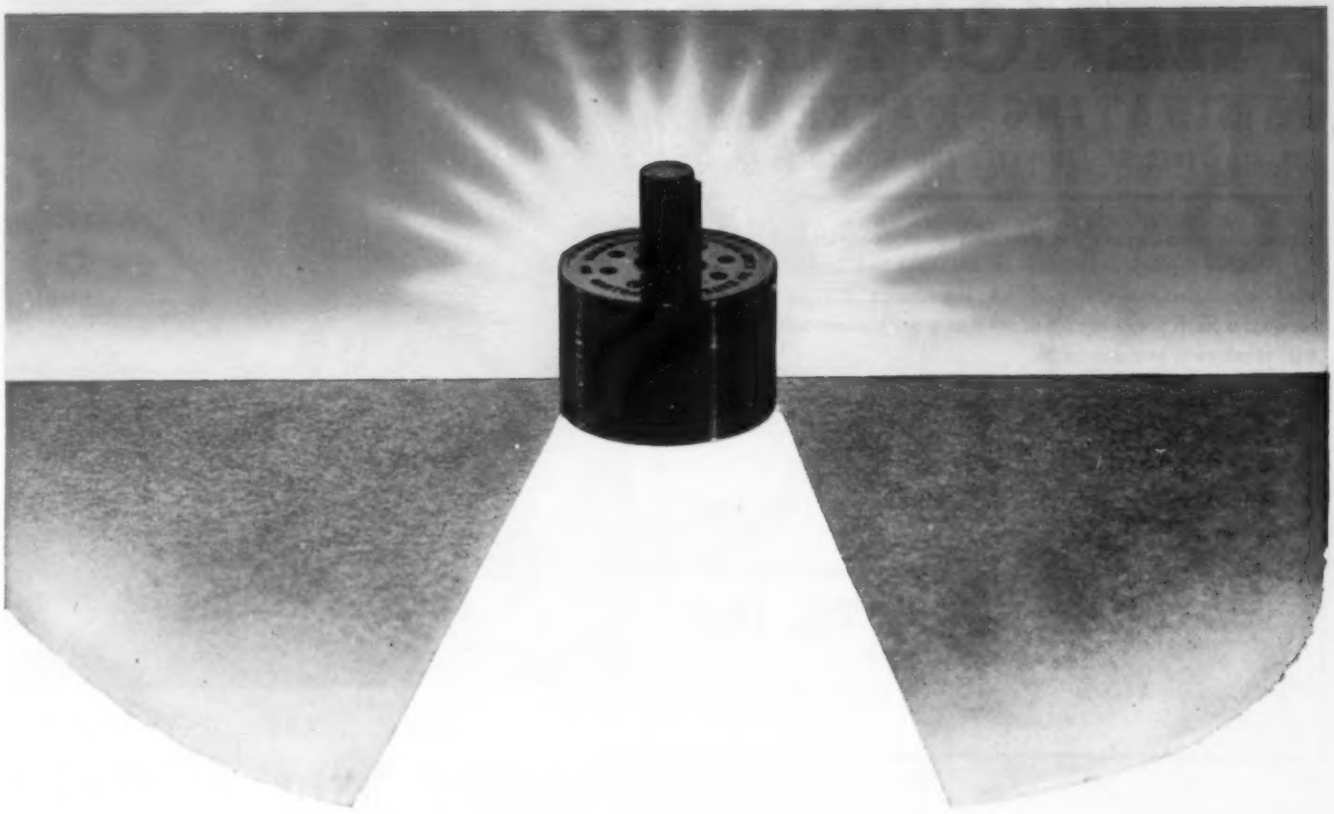
1811. Soap box with ridged bottom and top flange.

1812. Toothbrush case holding two toothbrushes.

* Reg. U. S. Patent Office.

The names and addresses of the manufacturers who make these stock molds are as follows: 1802, 1803, 1806–1810, Columbus Plastic Products, Inc., 519 Dublin Ave., Columbus, Ohio; 1804, Emeloid Mfg. Co., 946 Lake St., Newark, N. J.; 1805, 1812, Plastic Engineering, Inc., 8506 Lake Ave., Cleveland 2, Ohio; 1811, Plastic Manufacturers, Inc., 280 Fairfield Ave., Stamford, Conn.





BIG MAKERS OF SMALL PLASTICS

For many years we have specialized in making plastic closures.

Now the automatic machines that mold these closures make millions and millions of small plastic items to fill a vast variety of needs.

Our high production standards, our extensive research, our long manufacturing experience—mean that these thermosetting plastic units are turned out with dependability, efficiency, speed and economy!

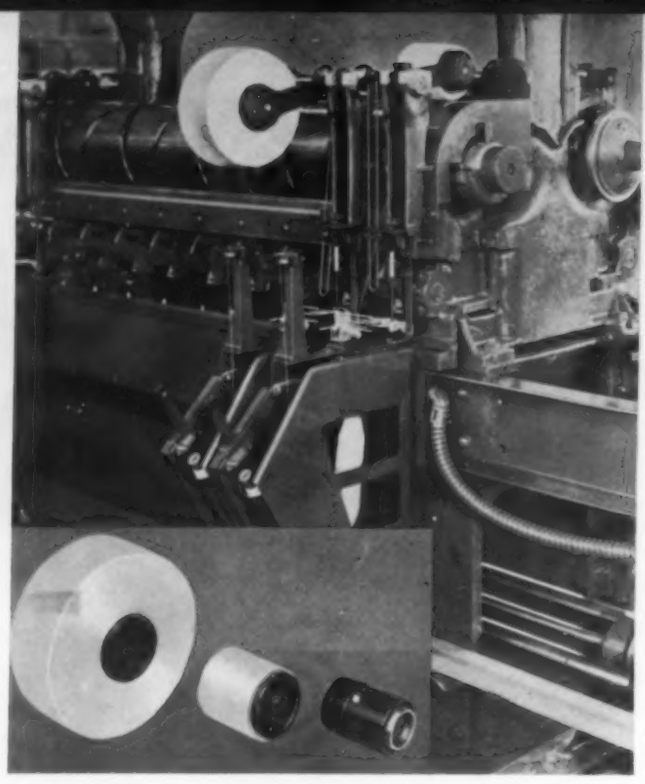
If you need small plastic units in large quantities, we are ideally suited to serve you.

LOOK FOR THIS TRADE MARK

PLASTICS DIVISION

OWENS-ILLINOIS GLASS COMPANY

TOLEDO 1, OHIO BRANCHES IN PRINCIPAL CITIES



Spooler uses phenolic

IN MODERN textile plants, high-speed operations on delicate fibers have forced creation of machines that can tie knots, check themselves in error and generally do everything but talk.

Just such a machine is the automatic spooler which makes use of Bakelite phenolic resin in a number of important operating parts. Developed by the Textile Machinery Div., Barber-Colman Co., Rockford, Ill., the machine is designed to wind yarn from small spinning bobbins onto large packages or "cheeses" (with phenolic cores) from which the yarn may then be unwound to become the warp of a fabric.

In the operation of this spooler, a motor-driven traveler rides up and down the machine, measuring the large warp packages as it passes. If a cheese is not being wound because thread is not being fed to it, the traveler, by means of suction, finds the end of the yarn on the surface of the cheese and carries it down to the mechanical knotter above bobbin.

In top photo, thread is delivered from a small bobbin up through a detector, around a revolving phenolic drum into which has been molded a zig-zag groove and onto the larger warp package. The cheese, or warp package, has a phenolic core sleeve and the zigzag grooves in the winding drum place the yarn on this sleeve so that it is in a self-supporting mass with vertical walls.

Inset photo shows cheese on its core sleeve at left, the sleeve with yarn starter in the center and the cheese core at right. The core itself is ball bearing. The sleeve is held in rigid alignment on the core by means of a ball detent in core and a groove on inside of sleeve.

Plastic templets

Clear acrylic templets and cellulose acetate layout mat are used to plan factory layout

THE USE of sheet acrylic and acetate has made possible a photographic innovation in the field of plant layout technique, an important factor in manufacturing efficiency.

Until recently, plant managers and production engineers used cardboard templets and layouts to plan the most effective use of available production space. The method worked, but the cardboard pieces were inconvenient to work with and easily became worn and damaged by repeated handling.

These disadvantages have been eliminated through the effective use of plastics in the Magne-Plastic Templets manufactured by John Hill Layouts, Mount Clemens, Mich.

Acrylic templets

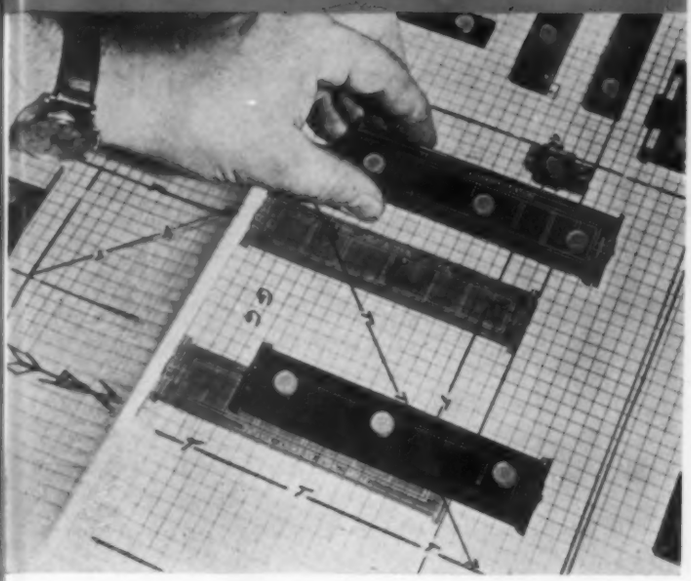
Permanent facsimiles of machines and equipment, scaled to size, are made from sheets of clear Plexiglas 1/8 in. thick, which are coated on one side with a photographic emulsion. Scaled drawings of the machinery and equipment can thus be reproduced as negatives on the plastic sheets.

The accurately scaled outlines are then cut to exact shape, resulting in durable templets which have outlines of the machines on their under sides. A small circular Alnico permanent magnet, inserted in a hole in the center of the acrylic machine templet, is held in place with wire.

Acetate layout mat

The magnetic machine templets are used in conjunction with a metal sheet and a thin transparent layout

held by magnets



Circular magnets set in machinery templets hold them in place on ink-scribed layout mat

mat of cellulose acetate. The mat is ink-scribed in 1/4-in. squares, each representing 1 sq. ft. of floor space. An outline can be drawn on the acetate layout mat to represent the limits of the plant area in which the machinery is to be arranged.

After the layout of the plant has been decided upon, the templets and mat can be used to make a permanent photographic print of the whole arrangement. To make this print, the smooth metal sheet is overlaid with a special printing paper and placed underneath the acetate layout mat. Outlines of material bins, tool cribs, traffic aisles, and conduits are grease-penciled on the surface of the acetate mat.

When the acrylic templets of machinery and equipment are placed on top of the mat, they are held in place by the attraction between the magnets imbedded in them and the metal plate underneath the acetate layout mat.

New method is economical

The printing paper is then exposed through the templets and the mat, the number of lamps necessary depending upon the over-all size of the scaled layout, which may represent up to 40,000 ft. of floor space. The pattern is then developed over an ammonia vaporizer in about 3 minutes.

The resulting print shows, in blue on white, a positive reproduction of each piece of machinery and each floor plan detail, superimposed on the scaled floor area.

It is claimed that the use of Magne-Plastic Templets makes possible considerable savings in layout work for large plants.

Cheese box

of transparent polystyrene

THE VALUE of re-use packages, employed successfully in decorated cheese spread glasses, has led the Kraft Foods Co. to introduce a transparent polystyrene container for its familiar Casino brand Camenbert cheese.

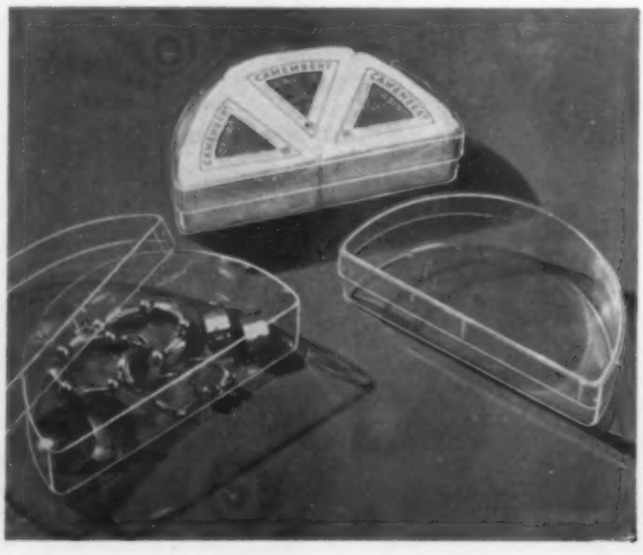
Believed to be the first commercial application of molded plastics as a food container, this box can be used around the house for any number of purposes—trinket box, small sewing kit, small change box, fisherman's lure or fly box, or as a container for small screws, nuts, and bolts. Because the material is transparent, the contents are easily visible without removing the top.

The half-moon shape with rounded edges, familiar to buyers of this cheese, is retained in this new container. It is injection molded by the Plastic Div., General American Transportation Corp., of Chicago, Ill., of Lustron polystyrene. A 6-cavity combination die which turns out three bottoms and three lids at once is employed. The walls of both sections are approximately 0.045 in. thick.

Design allows circulating air

Because the cheese needs air to "breathe," the lid is oversize and does not come entirely down on top of the bottom. To accomplish this, five ribs are molded on the inside of the top. These insure a friction fit with the sides of the bottom piece, but leave gaps for air. Three nibs on the inside of the top in turn prevent the lid from seating all the way down.

With the cheese removed, the box can be used for holding jewelry or other household items



Dust precipitator

TWO APPLICATIONS of plastics as insulating materials are important factors in the successful operation of the Electro Airmat, a new electronic dust precipitator which combines the advantages of both electronic and mechanical filtration in a compact, lightweight unit which is easy to install and maintain. For carrying high voltages, thorough insulation of both bus bar and lead-in rods in the unit was essential—hence the selection of cellulose acetate butyrate and a high pressure phenolic laminate for this job.

This precipitator, made by American Air Filter Co., Inc., Louisville, Ky., uses a charged paper mat instead of metal plate collectors.

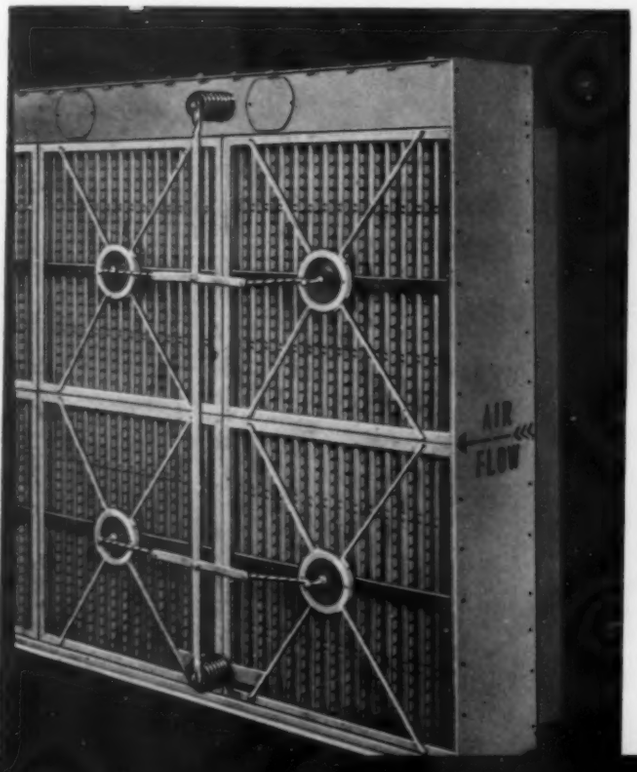
Electrodes at front of grille

The electrostatic Airmat paper is held on a pleating frame in the form of large V's in a collector element. At the front of this is a grille containing the charged and grounded electrodes which produce the electrostatic field in the paper. The charged electrodes, in turn, are connected to a horizontal bus bar through which the electricity flows to the charged units, in such a way that proportionate areas of the paper are positively and negatively charged.

Cellulose acetate butyrate tubing

Figure 1 shows a front view of a complete assembly of dust collectors in a straight bank arrangement. Into each collecting element passes a high voltage lead

1—Phenolic laminate bus bars and cellulose acetate butyrate tubing are used for insulation in dust collectors of new precipitator



2—Half of an individual collector element

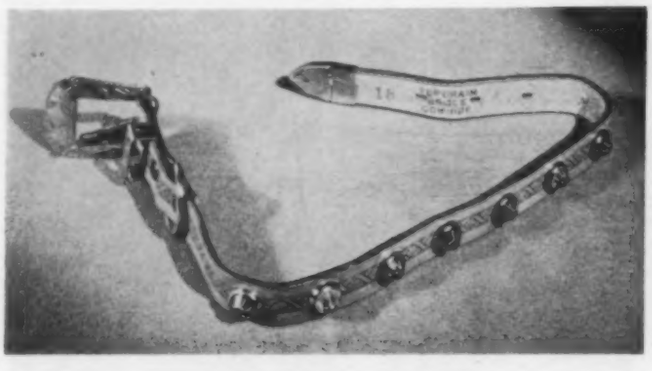
with a resistor inclosed in tubing made of Tenite II. Figure 2 shows half of an individual collector element from the rear, with tubing of Tenite II again insulating high voltage lead-in rods carrying 9000 volts potential to the charged electrodes. The square bus bar insulators are made of Textolite high pressure phenolic laminate.

Plastic jewels guard dogs

NIGHT-TIME highway and street casualties of dogs may drop sharply with the introduction of the new "K-9" Sparkler dog collar by M. Slifka & Sons, Inc., New York City leather goods manufacturer. Polystyrene jewels on the collar pick up reflections from approaching automobile headlights and warn the driver that a dog has strayed into his path.

The jewels are molded of red, blue, green, or amber Loalin by Otto F. Umann of Manhasset, N. Y. Careful curing was required to eliminate bubbles and sink-marks. Loop, tip, and buckle are of metal while the collar itself is of top grain leather.

Polystyrene jewels on this collar reflect car lights and give dogs added protection at night



Kodak

THE OUTSTANDING THING about an individual "showcase" made of Kodapak Sheet is the product that's presented in it—this pipe, for example.

Kodapak Sheet invites inspection of every detail of the product. Yet this sparkling, optically clear, durable packaging keeps the product new, clean, and safe—well protected from the store wear and unnecessary fingering that so frequently interfere seriously with a product's salability.

Kodapak Sheet is supplied in two forms: Kodapak I, cellulose acetate, in gauges from No. 88 (0.00088″) to 20 thousandths (0.020″); Kodapak II, cellulose acetate butyrate, in gauges from No. 90 (0.00090″) to No. 200 (0.00200″).

If you want to learn more about this versatile material, the Kodapak Demonstration Laboratory in Rochester is available to demonstrate fabrication possibilities and uses. Write for an appointment.

CELLULOSE PRODUCTS DIVISION
EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Right in sight... in Kodapak Sheet

Kodapak Sheet . . . FOR THE DISPLAY YOU WANT . . . THE PROTECTION YOU NEED

T. M. Kodapak Reg. U. S. Pat. Off.

New Orleans welcomes the plastics industries

The Foreign Trade Zone speeds commerce and facilitates international trade.

International Trade Mart, where the products of the world are displayed for wholesale trading.

LET US SEND YOU FREE . . . a copy of our recently completed study, "The Opportunity for the MANUFACTURE of PLASTICS and PLASTIC PRODUCTS in the City of New Orleans", giving more detailed information on the profitable possibilities of a New Orleans location. Write:

GREATER NEW ORLEANS, INC.,
1024 Maison Blanche Bldg., New Orleans 16, La.

. . . Means More PROFITS for YOU!

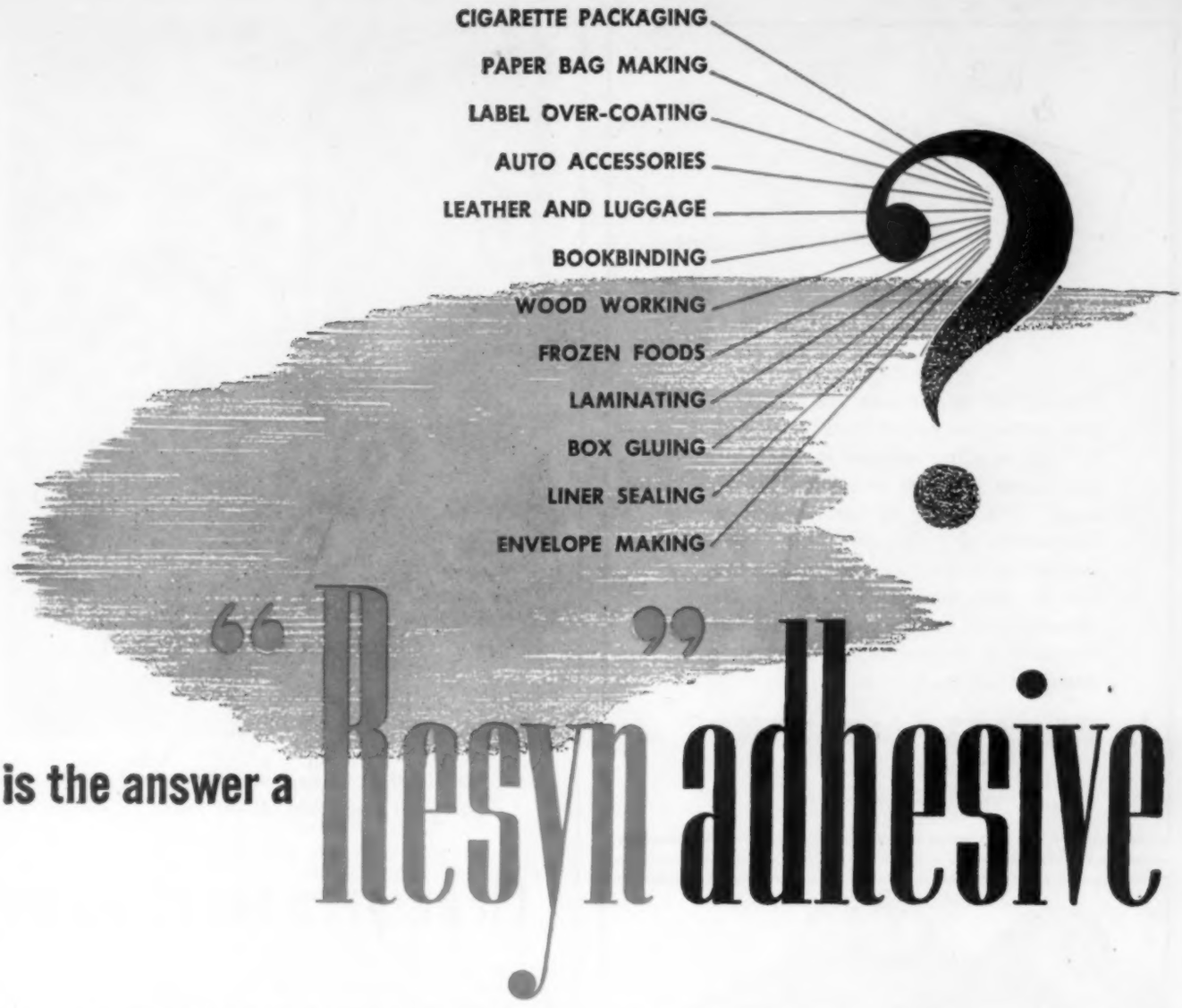
MARKETS MEAN PROFITS! . . . Here, your plant is situated *midway* between the eager domestic and foreign markets . . . at home, the vast Mississippi Valley and 10 progressive southern states which need more plastics than they produce . . . and below us, the rapidly increasing Latin American and Caribbean market which imported more than $17,000,000 of plastic materials and products in 1946. About half of the Latin American republics neither manufacture their own plastic materials nor fabricate semi-finished forms of plastics.

RESOURCES MEAN PROFITS! . . . Raw materials native to Louisiana in quantity include cotton, wood pulp, soda ash, sulphur, bagasse, and petroleum derivatives, acetic acid, benzol, formaldehyde, resins and acrylic acid. In addition, many substances used in the manufacture of plastic materials are imported through the Port of New Orleans and are available, as, for example, casein and castor beans. Of great importance too is the unlimited supply of low cost natural gas from deep wells near the city, and ready, economical electrical power.

TRANSPORTATION MEANS PROFITS! . . . From the large, sheltered harbor 97 ship and barge lines send deep-draft vessels to the seaports of the world, and modern barges inland economically over a 15,000 mile waterways system. Nine trunk line railroads converge here, and 8 major air lines, 24 motor freight lines. Besides these essentials for industrial profit, New Orleans offers the unequalled trade facilities presented by International House, International Trade Mart and the Foreign Trade Zone. The supply of *Skilled Labor* has more than doubled since 1940, and *Friendly Taxation,* local and state, encourages industrial growth. Investigate now.

GREATER NEW ORLEANS

MARKETS TRANSPORT RESOURCES



"?" is the answer a Resyn adhesive

Each "RESYN" Adhesive is a complex blend that is designed to do a specific job exceedingly well. Many amazing developments have resulted from applying them to packaging, converting and assembling operations previously thought to be at their highest level of efficiency.

Why? Because "RESYN" adhesives provide higher resistance against all forms of moisture and temperature variations. They're vermin-proof, mould-proof, age-proof. They're economical. They increase production speeds, reduce supervision, offer greater versatility, spread and penetrate uniformly, and bring increased sales advantages to many products.

What are some uses? *In bag making:* for difficult stocks . . . breather action . . . moisture vapor barrier. *In luggage making:* for softness and pliability . . . resistance to fungus . . . laminating before shaping under heat and pressure. *In chemical packaging:* for all-purpose, all-weather labeling and overcoating on wood, fiber, painted steel, tin and glass. *In upholstering:* for adhering cloth to cloth, chipboard, wood, metal, wadding, etc.

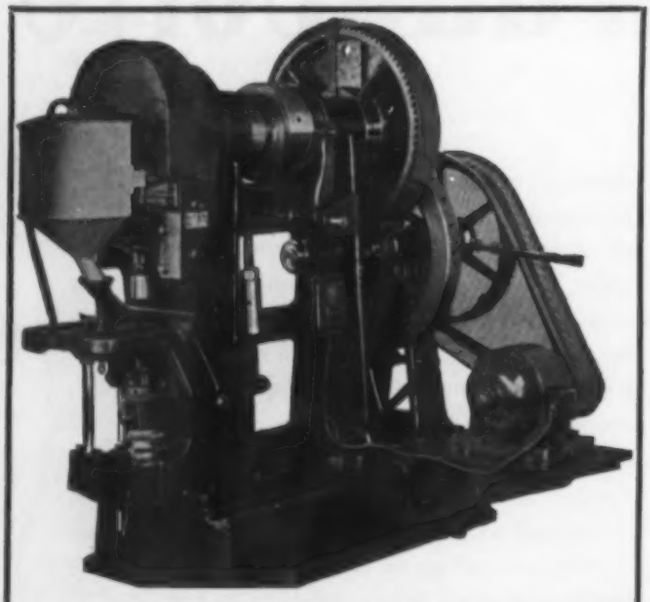
A whole new world of uses is opening up for "RESYN" adhesives. They're readily available. So get acquainted with their types, properties, uses. All are quickly summed up by National Adhesive in an interesting booklet: When and How to Use "RESYN" Adhesives. Write for your copy — NOW!


Dunellen Plant

Offices: 270 Madison Avenue, New York 16; 3641 So. Washtenaw Avenue, Chicago 32; 735 Battery Street, San Francisco 11, and in other principal cities. In Canada: Meredith, Simmons & Co., Ltd., Toronto. In England: National Adhesives, Ltd., Slough.

National ADHESIVES

EVERY TYPE OF ADHESIVE FOR EVERY INDUSTRIAL USE



Distinctive colors show the subway rider the quickest and most direct route to destination

Clean permanent maps

IN THE New York City subways, durability and clean bright appearance are foremost considerations because of the millions who make use of the transit systems daily.

Filling these requirements and also saving the city $72,000 in installation costs are new plastic subway maps which recently replaced the old framed, glass-covered paper type. Upkeep will also be less for there is no glass to break, no frames to replace.

These new Graphic Lamicoid guides, showing 250 miles of unified subway and elevated lines, are produced in full color by the Hagstrom Map Co. of New York City and laminated with colorless Melmac resin by the Mica Insulator Co., Schenectady, N. Y. Each map is 41 in. high, 26 in. wide and 1/8 in. thick, and has the three subway systems indicated by three distinct colors. Parks, airways, railroad terminals, and other points of interest are also marked.

The Board of Transportation's specifications of resistance to heat, water, oil, kerosene, benzene, alcohol, grease, nail polish remover, lipstick, and other similar substances have all been met. In addition, the plastic surface of the laminated maps resists scratching and scuffing, is easily cleaned, and prevents the colors from fading or becoming discolored.

Toothpaste tube cap

has hinged closure

which cannot be lost

JOLLY KAP, a new type plastic closure for toothpaste tubes, which remains in place permanently, may well lead to a changeover in closure design for numerous other products sold in collapsible tubes.

Introduced by White Pharmacal Co., New York City, this animated closure is being sold with each tube of Kolynos toothpaste. Its operation is simple. When the Jolly Kap is screwed on top of the tube in place of the usual closure, the toothpaste may be ejected through a slit which subs for Jolly Kap's mouth. The hat swivels back and forth on lugs resembling ears and covers the slit when the tube is not in use.

Kaye Plastics Corp., New Brunswick, N. J., which designed the closure, injection molds the head of Lustron polystyrene; the hat of cellulose acetate. So far, colors have been limited to red and yellow—some caps with red hats and yellow heads; others with yellow hats and red heads. However, Whitehall is planning to add additional colors for eye appeal and to give the shopper a wider selection.

Below—New animated toothpaste closure is attached to top of retail package. Left—After screwing Jolly Kap onto tube, the user merely tips its hat and squeezes tube to obtain toothpaste

. . . and for casting and laminating uses rely on Paraplex "P" Series resins

Jato*, jet-assisted rockets that enable heavily laden aircraft to take off from the water or small fields, need a solid fuel that burns at a rapid, even, controlled rate. PARAPLEX P-10, most flexible of the "P" series, is used as the binder because of ease of casting and performance over wide temperature range.

This unusual use for PARAPLEX P-10 is but one of many for the "P" series. Ranging from highly flexible to extremely rigid, these resins are useful as thermoset binders in abrasive wheels, molded boats and housings, potting compounds, setting brush bristles and many other applications.

PARAPLEX "P" resins have excellent color and resistance to water and chemicals, and are non-extractible. 100% reactive, they cure at moderate temperatures, under contact pressure, to form clear, tough, homogeneous compositions. If you are making impregnated fabrics, wall coverings, flooring compositions, luggage or rigid laminates, you'll want the full story on these unique resins. Write for booklet, "PARAPLEX for Laminating and Casting Applications."

Produced by Aerojet Engineering Corporation, Azusa, Calif.

PARAPLEX *is a trade-mark, Reg. U.S. Pat. Off.*

Represented by Cia. Rohm y Haas, S.R.L. Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Increasing use of

WHENEVER there is a question as to whether plastics are better suited to a particular application than any other material, one outstanding example is usually cited—the telephone housing. It is certainly one of the oldest applications for plastics and one that has had great prestige value.

For years Western Electric Co., Inc., of New York City, has been using phenolic for the telephone hous-

1—This 1904 model of the telephone has mouthpiece and receiver molded of synthetic rubber plastic composition

2—A molded phenolic body mounted on metal base of this model hand set illustrates the progress made by 1927

plastics in telephones

ings which it makes for the Bell System. The material is strong, light in weight, will not rust or chip, is pleasant to the touch and has good insulating properties.

Easy disassembly necessary

One has only to look at his own telephone to see the intricate molding that a telephone housing must withstand. This is particularly evident in the combined receiver and mouthpiece of the latest model (Fig. 3). Not only is this telephone part molded in rounded contours with various undercuts, but it is made so that it can be easily and quickly disassembled by repair men.

Evolution of telephone housing

The evolution of the telephone is shown in the photographs accompanying this article. Figure 1 shows the 1904 model of the telephone having a mouthpiece and receiver molded of a synthetic rubber-plastic composition. Figure 2 shows the 1927 model hand set in which the molded phenolic body was mounted on a metal base. Both of these models were, in the light of present day streamlined standards, rather angular. This was, in part, dictated by the then current molding methods. As the market for telephones expanded and as public demand for simplicity of line in architecture and furnishings increased, a more graceful telephone emerged.

The latest hand set model (Fig. 3) is all plastic except for the dial. Before the war, the vast amounts of communications equipment needed for our armed forces made it necessary for Western Electric Co. to suspend the manufacture of telephonic equipment for civilian purposes and this model did not acquire widespread circulation. But now, with the war over and production in full swing, the company is trying to catch up on back orders with this hand set.

3—With the changeover to an all plastic housing, a more streamlined telephone is possible. Only dial is metal

Now Available

LEVERPAK DRUMS FOR MOLDING POWDERS

RAW MATERIALS are coming through in healthy quantities—permitting Continental's expanded production facilities to push out more and more Leverpak fibre drums. Plan now to use this efficient, easy-to-handle, durable container that has served the plastics industry so well for so many years. Get in touch with The Container Company today

IT PAYS TO USE THIS PERFECT PACKAGE

FULL OPENING, FULL ACCESSIBILITY!

PROTECTS AGAINST CONTAMINATION!

EASY TO FILL, EASY TO EMPTY!

CONVENIENT LOCKING BAND!

CAN BE RE-USED FOR FINISHED PRODUCTS!

LIGHT WEIGHT BUT RUGGED FOR ALL TYPES OF SHIPMENTS!

CONTINENTAL CAN COMPANY

The Container Company Division, Van Wert, Ohio

The Better Way to PLASTICS MOLDING

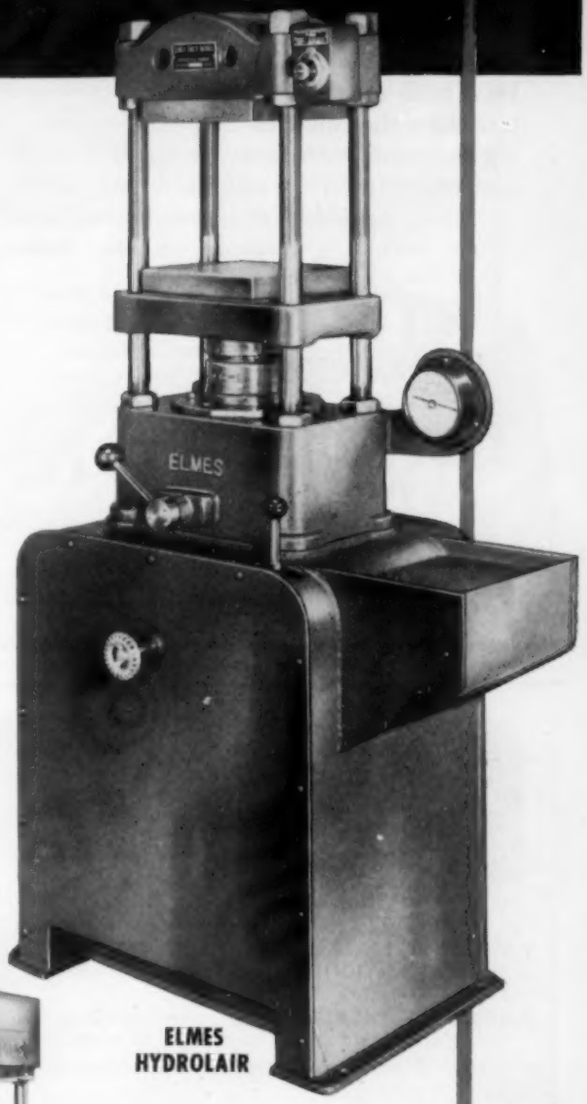
● Behind the excellent performance of Elmes hydraulic presses lies almost a century of molding experience—nearly 100 years of constant *improvement* in methods and machinery. Elmes equipment brings you the most up-to-date features . . . maintains the *quality* of your products . . . helps *speed production* and *cut costs.*

FOR CONFIDENCE IN YOUR PRODUCTION

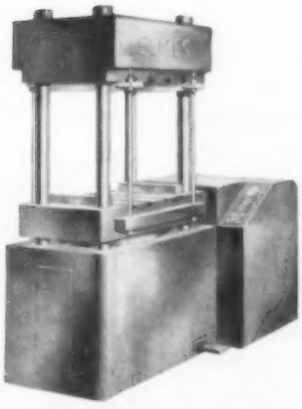
Elmes presses are flexible, convenient, easy to use. Bring operating economies to *both* long and short runs. Handle a multiplicity of jobs. Your choice of full manual or time-cycle control—with *precise regulation* of speed, pressure, and time on *all* presses. Whatever the job or size of the order, you'll find Elmes hydraulic presses tops for speedy, *accurate* results. You can put your Elmes into *high-gear production* with confidence.

ALL ELMES FACILITIES AT YOUR SERVICE

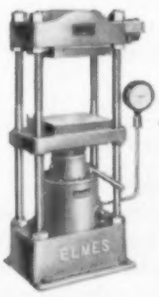
Let Elmes experience and foresight serve *you.* Write or phone for assistance in solving your problems. No obligation. And ask for Booklet No. 5200—it gives you factful descriptions, detailed specifications of Elmes hydraulic equipment *for the plastics industry.* Write *today.* "Put *your* pressing problems up to Elmes."



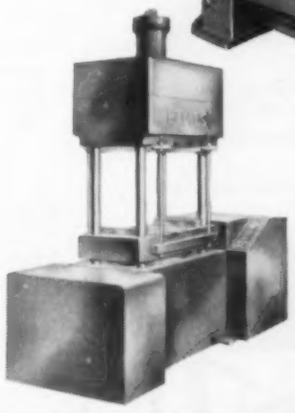
ELMES HYDROLAIR



COMPRESSION MOLDING PRESS



LABORATORY PRESS



TRANSFER MOLDING PRESS

ENGINEERED BY ELMES
Good Hydraulic Production Equipment Since 1851

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES, 225 N. Morgan St., Chicago 7, Ill.

Distributors in Principal Industrial Centers

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Consumption of

OVER-ALL plastics raw materials consumption continued to rise in September. While certain categories slipped from August figures, others gained sufficiently to boost the average. Vinyl resins, which gained almost 1,500,000 lb. in August over July, jumped even faster in September to show about a 2,200,000 lb. increase over August. Only the textile and paper coating category showed any decline.

Phenolic adhesives slipped about 400,000 lb., but

PLASTICS AND SYNTHETIC RESIN CONSUMPTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[a]
All other, including casting (dry basis)[c]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[a,d]
Total
Polystyrene[a,e]
Vinyl resins
Sheeting and film, including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other, including adhesives (resin content)[c]
Total
Miscellaneous
Molding materials[a,f]
All other (dry basis)[c,g]
Total
Grand Total

[a] Includes fillers, plasticizers and extenders. [b] Data cannot be published without disclosing operations of individual establishments. [c] Excludes data for protective coating resins. [d] Excludes urea and melamine molding materials, see footnote *f*. [e] Dry basis, including necessary coloring material. [f] Includes

plastics materials

rises in the laminating, molding material, and miscellaneous categories upped the grand total by over 1,000,000 pounds. Polystyrene continued to zoom upward with another 1,000,000 lb. spurt, and cellulose acetate and mixed ester plastics showed a gain of more than 500,000 pounds. However, in the latter class, molding and extrusion materials accounted for the gain; sheets, rods and tubes declined. Ureas and melamines exclusive of molding powder gained about 300,000 pounds.

IN POUNDS FOR JAN. THROUGH SEPT. 1947
Census, Industry Division, Chemical Unit

August 1947	*September 1947*	*Total for first 9 months*
lb.	*lb.*	*lb.*
559,201	457,878	5,781,761
621,689	608,700	5,463,955
297,933	217,844	3,072,353
3,403,811[h]	4,121,985	44,913,795
4,881,634[h]	5,406,407	59,231,864
682,156	669,081	7,211,950
220,517	251,431	2,959,957
902,673	920,512	10,171,907
[b]	[b]	1,685,554[c]
2,711,686	3,396,258	30,358,918
1,590,097[h]	1,766,449	15,292,469
17,895,179[h]	17,408,459	143,853,905
3,803,392[h]	4,735,441	48,406,623
26,000,354[h]	27,307,007	237,912,315
3,604,625	3,995,240	35,743,399
1,343,035	1,274,285	12,268,432
514,137	455,216	5,807,634
5,461,797	5,724,741	53,819,465
7,075,382[h]	8,381,059	62,005,810
4,105,498	5,790,041	45,124,818
1,649,818	1,193,678	11,592,366
4,826,062	5,787,689	51,853,972
2,335,582	2,353,845	19,985,544
12,916,960	15,125,253	128,556,700
3,600,678	4,397,938	42,198,395
1,966,627[h]	3,634,228	21,829,321
5,567,305[h]	8,032,166	64,027,716
62,806,105[h]	70,897,145	617,411,331

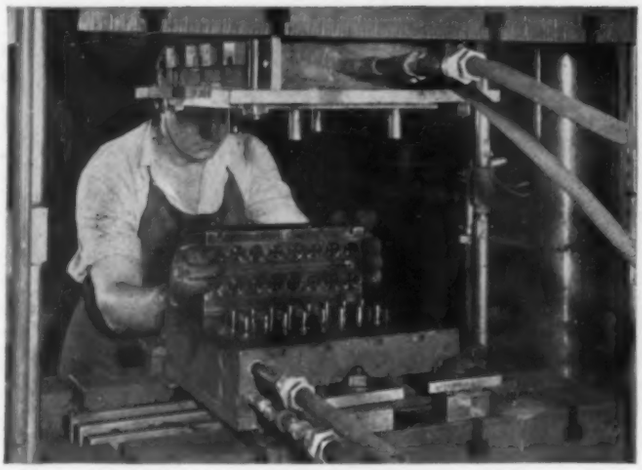
data for urea and melamine, acrylic acid and miscellaneous molding materials. [g] Includes data for petroleum resins, acrylic acid ester resins, mixtures and miscellaneous synthetic materials. [h] Revised. [c] Total for January through April only.

LAKE ERIE Duplex Presses

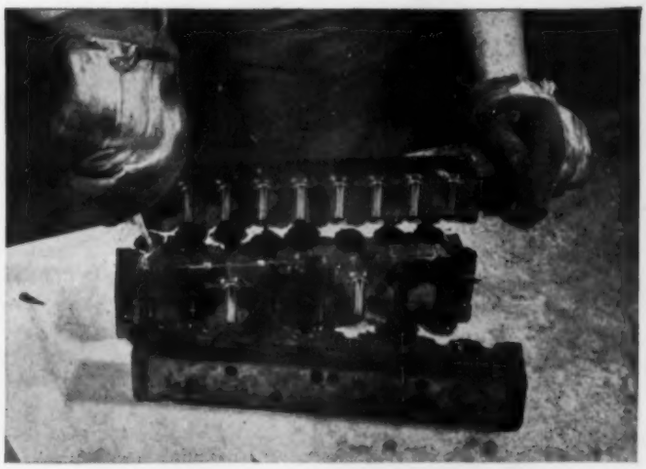
ABOVE—A 300-ton Lake Erie Duplex Press molding spools used in desk telephone sets. Spools were formerly molded on a single action press... new method is much faster.

RIGHT—Four new Lake Erie Duplex Molding Presses (1-300 ton, 1-200 ton, 2-100 ton) in operation in the Federal Telephone and Radio Corp. plant. Four more Lake Erie presses on order will be installed in the open spaces shown in foreground.

Boost Plant Output for Federal Telephone and Radio

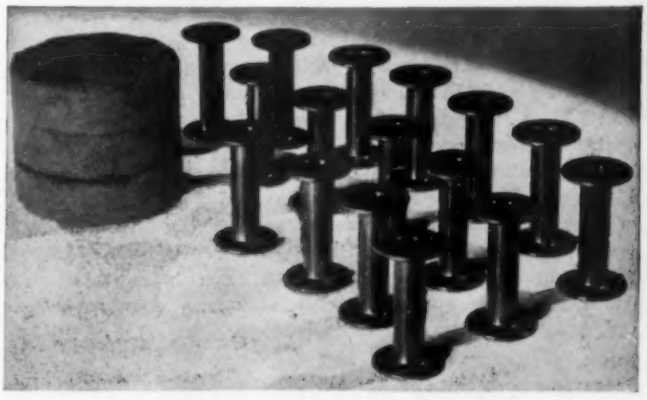


Removing mold from press. The Durez preforms are preheated on a Megatherm Electronic heater designed and produced by Federal Telephone and Radio Corp.



Removing spools from mold. Quality of spools is better and rejects and waste have been reduced with new Lake Erie Duplex Press on the job.

GREATER molding speed is but one of the many advantages of the four new Lake Erie Presses placed in service by Federal Telephone and Radio Corp. In addition to increased production, quality of molded parts has improved, rejects and waste have been reduced and unit costs have been brought down. These benefits are made possible by continuing advances in molding techniques and press designs. At Lake Erie, press designs are based on alert research that combines the best thinking of progressive molders and our own experienced engineers. That's why more and more molders are selecting Lake Erie presses . . . why many are replacing older, outmoded presses with the latest Lake Erie equipment.



Spools, also called ringer bobbins, ready to be wound with wire prior to installation in telephone. This is but one of many parts molded on Lake Erie Presses.

● Leading manufacturer of hydraulic presses—all sizes and types—plastic molding . . . metal working . . . forging . . . metal extrusion . . . processing . . . rubber vulcanizing . . . stereotyping . . . special purpose.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE ENGINEERING CORP.
MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY
General Offices and Plant:
868 Woodward Avenue, Buffalo 17, New York

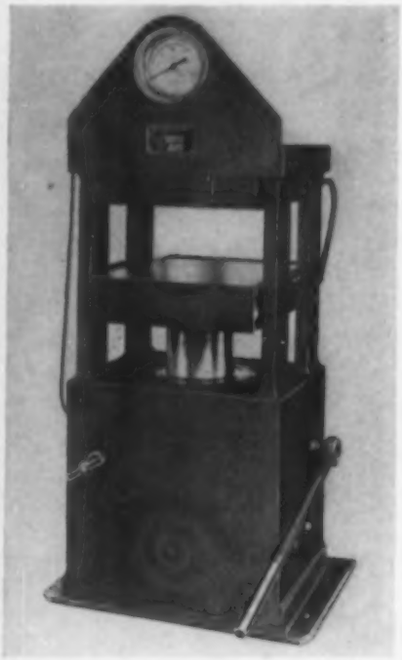
★

FELLER ENGINEERING DIVISION
SPECIALISTS—EXTRUSION AND
FORGING PRESSES
1100 Empire Building, Pittsburgh 22, Pennsylvania

OFFICES IN PRINCIPAL CITIES AND FOREIGN COUNTRIES

New Machinery and Equipment

Thirty-ton hydraulic press—A 30-ton electric hot plate molding press, designed especially for the plastics and rubber industries, has been announced by M & N Machine Tool Works, 144–146 Orono St., Clifton, N. J. This press can be obtained with any desired amount of openings and either electric heated or steam platens. Larger platens and motor driven hydraulic units are also available. Specifications of the unit pictured here include: 12- by 12-in. platen size, 10-in. daylight opening, 6-in. stroke, 5-in. ram diameter. It has all steel parts and double acting hand pump.



Time cycle controller—A PB2 time cycle controller for the control of plastic and rubber molding equipment has been developed by Seely Instrument Co., Inc., 328 Fourth St., Niagara Falls, N. Y. It starts, times, correlates, and stops multiple operations in any process or machine cycle which can be actuated by air pressure or electricity. The time selector wheel carries 150 keys. These are selected to provide timing, to within 0.67 of 1 percent of the overall time range of the instrument, for each successive event scheduled in the operation selector. Standard cycles are available to 750 minutes. The operation selector camshaft, with 10 working positions, operates pilot valves or precision switches in any desired sequence.

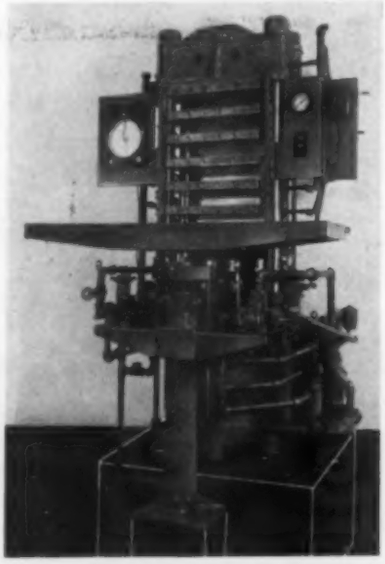
Fifty-ton hydraulic press—For plastic molding and laminating operations in plastic, wood or rubber, Laboratory Specialties, Inc., of Wabash, Ind., has introduced the Wabash 50-ton hydraulic press with platens 12 by 15 in. or 18 by 24 inches. Rapid closing of platen is provided by a high-speed hydraulic pump, motor driven through variable speed pulleys. The pump operates at high speed to close the platens and at slow speed to afford the needed pressure for molding and laminating, and also for maintaining maximum pressure on work. A pressure gage, provided with hand-set pointer, automatically controls the maximum pressure. Platens with water cooling channels are available.

Multiple press unit—Air-Hydraulics, Inc., 401 Broadway, New York City, has announced a multiple-press unit which is readily adjustable to perform two, three, four or more operations simultaneously under one valve control. For example, one press may be tooled for blanking, another for crimping, and a third for stamping. Distance between the presses may be adjusted to suit the need. These presses are used for all operations that are usually done on kick presses and arbor presses. Since pressure is applied by squeeze, impact shock damage is eliminated. The presses come in two sizes, delivering from the most delicate pressure up to either $2^1/_2$ or 6 tons of pressure. They are available with foot control valve or with solenoid operated push button control.

Chuck and cylinder combination—To increase production where extensive drilling, tapping, or counter-boring operations are performed, Anker-Holth Mfg. Co., 2723 Conner St., Port Huron, Mich., has introduced a new type Airgrip drill press chuck and cylinder combination with a foot control air valve. This unit consists of a standard chuck mounted directly on a non-rotating cylinder, having a mounting base suitable for drill press or similar tables. Chuck and cylinder combinations can be furnished with either solid or hollow centers. The foot control valve automatically locks into position when the operator applies the initial pressure. Pressure is applied again when the operator is ready to release the valve.

Heating unit—For uniform temperatures so necessary for plastic extrusion and injection molding machines, Edwin L. Wiegan, 7503 Thomas Blvd., Pittsburgh 8, Pa., is now offering a new Chromalox cast-in-aluminum tubular electric heating unit. It is designed especially for clamping to cylindrical surfaces and is applied to a barrel or cylinder as two individual semi-circular units held together by clamping bands. The aluminum distributes heat from the tubular electric unit and is said to make possible lower operating temperatures and longer heater life. Heater diameters to fit various barrel diameters and temperature requirements are available.

Compression molding press—Farrel-Birmingham Co., Inc., Ansonia, Conn., has announced a 24- by 24-in., six-opening, hydraulic press designed for molding plastics and rubber articles. Initial pressure is 2000 p.s.i. which gives a plate pressure of 614 p.s.i., or a total capacity of 177 tons, with maximum deflection over the platen area of 0.005 inch. The motor-driven oil pressure pump is a radial piston duplex type, equipped with cooler and filter. Its capacity gives a closing speed of 59 in. per min., a pressing speed of 3 in. per min. and a lift table rise of 231 in. per minute.



Ram operation is by a four-way valve equipped with hand lever; the lift table is operated by a separate hand lever valve. Automatic controls include the blow-down timer which gives intermittent release of condensation from the platens.

Books and Booklets

Write directly to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery.

Fabric Structure

by John H. Strong

Published by Chemical Publishing Co., Inc., 26 Court St., Brooklyn, N. Y., 1947

Price $6.00 **241 pages**

This thoroughly illustrated and practical textbook on the details of fabric construction is based on operations in the Lancashire textile industry in Britain. The foundation of the structure of new fabrics rests in the synthetic fibers that have been developed and in the combination of these fibers with natural fibers. The book is a practical "how to" treatise on the subject.

Coating and Ink Resins

by Dr. William Krumbhaar

Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y., 1947

Price $7.00 **318 pages**

Ten years ago this author published "Chemistry of Synthetic Surface Coatings." The group of synthetic resins has undergone such important development and expansion since, that this new and separate discussion of coating and ink resins will be welcome. The scope of the text is confined to the light colored, hard, soluble, and high viscosity groups of phenolic, maleic, and copal type synthetics as used in surface coatings and printing inks. Considering the complexity of the subject, the book is written with amazing simplicity, and is thoroughly indexed.

Plastics and You

by Stephen Bass

Published by Eastwood-Steli Co., 1440 Broadway, New York, N. Y.

Price $2.75 **190 pages**

The story of plastics is presented here in simplified form and should prove of interest to the layman who has little or no knowledge of plastics. The text touches on the development of the industry, explains the main types of plastics materials and how they are molded, and reviews employment opportunities.

Essentials of Applied Physics

by Royal M. Frye

Published by Prentice-Hall, Inc., 70 Fifth Ave., New York, N. Y.

Price $4.35 **322 pages**

This book is designed to provide students with practical knowledge of applied mechanics, heat, light, and electricity. Modern viewpoints on light are employed while, at the same time, advantages of the wave theory of light have been retained. The electron current is used exclusively, rather than the conventional positive current. The practical electrical units are used instead of the two e.g.s. electrical systems of units. As preparation for this, the kilogram-meter-second system and the English system of units are used in the chapters on mechanics. The material covered includes: Newton's laws; force, work, energy, power; fluids; elasticity; vectors; properties of waves; sound, heat and temperature; thermodynamics; magnetism; static electricity; electric currents, resistance, inductance; photometry; radio and radar; lenses; and so on.

Ion exchange resins, and resins in paper—The Resinous Products & Chemical Co., W. Washington Sq., Washington 5, Pa., has issued two new booklets. "The Uformites for paper," totaling 16 pages, describes the production of wet strength papers with Uformite resins. Specific data on preparation, operating conditions, dilution of resin, and broke recovery with Formite 467, 470 and 500 are treated in detail.

The second booklet discusses the role of Amberlites, ion exchange resins, in water treatment and chemical processing. Processes described include deionization of locomotive water, isolation of rare earth metal salts, control of alkalinity, concentration of chemical elements, recovery of acids, prevention of scale in heat transfer processes, liberation of weak bases, and adjustment of salt content.

Shipment and sealing—Better Packages, Inc., Shelton, Conn., is offering a 16-page graphically illustrated handbook on correct tape moistening and proper application of tape to cartons.

Dilatation interferometer—Bulletin 140-72 entitled, "Dilatation interferometer," issued by the Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill., describes and illustrates a complete assembly for measuring the coefficient of thermal expansion of small solid specimens by the interferometer principle. The equipment is used for measuring dilatation curves of materials which are to be fused together, such as plastics, metal and glass, metal and vitreous enamel, etc.

Continuous extrusion takeup equipment—Newest developments in continuous extrusion takeup equipment are described in a 12-page brochure, Part IV of a series called "Blueprint for industry," just issued by Industrial Ovens, Inc., 13825 Triskett Rd., Cleveland 11, Ohio. It includes full technical information on a new constant tension continuous takeup machine with integral capstan and drive; new extrusion systems for wire, cable, monofilaments or tubings; large cooling capacity plastic tubing takeups; and plastic takeups for "in line" operations.

Scientific management—"Progress in scientific management, 1945–1947," a catalog of AMA publications in seven fields of management, has been released by the American Management Association, 330 W. 42nd St., New York City 18. These fields are: personnel management, office management, production, marketing and sales management, financial management, insurance, and packaging.

Relation between sag and belt length—According to a bulletin released by the B. F. Goodrich Co., Akron, Ohio, the relation between sag and belt length is generally misunderstood, leading to an exaggerated idea of the difference in lengths between V-belts on a multi-V drive. A table is given which shows the differential in length between a belt which is tight and one which sags on the same drive.

Continuous blowoff systems, steam purification units—Cochrane Corp., 17th St. and Allegheny Ave., Philadelphia 32,

Pa., has released two booklets, one describing five different flash-tank and heat-exchanger systems and the other describing steam purification units for the removal of moisture and solids in steam lines. Bulletin No. 2725 on steam purifiers contains application data, hook-up diagrams, installation photographs and accessory descriptions. Bulletin No. 4410 on blowoff systems includes a description of two thermostatically controlled systems for automatically proportioning the rate of blowoff to makeup water, a list of users interspersed with case histories, and a detailed calculation of savings under actual plant conditions.

Handling of metals—American Nickeloid Co., Peru, Ill., has issued a 16-page booklet, "N-M Fabrication Handbook," which supplies general informational data and practical fabricating suggestions relative to the proper handling of pre-finished Nickeloid metals. Proper bending, blanking, drawing, etching, forming, riveting, seaming, soldering, and welding operations involved in the successful handling of these metals are described. General information is included as to kinds, styles, and patterns available in this line of metals.

Protective coating and lining process—A brochure on Lithcote protective coatings and linings for steel and other metals is being offered by the Lithgow Corp., 333 W. 40th Place, Chicago 9, Ill. These may be used on many types of processing, storage, or transportation equipment.

Cross-laminating of oak—The Virginia Polytechnic Institute, Blacksburg, Va., has issued a bulletin entitled "Limitations in cross-laminating of oak under extreme service conditions," written by E. George Stern.

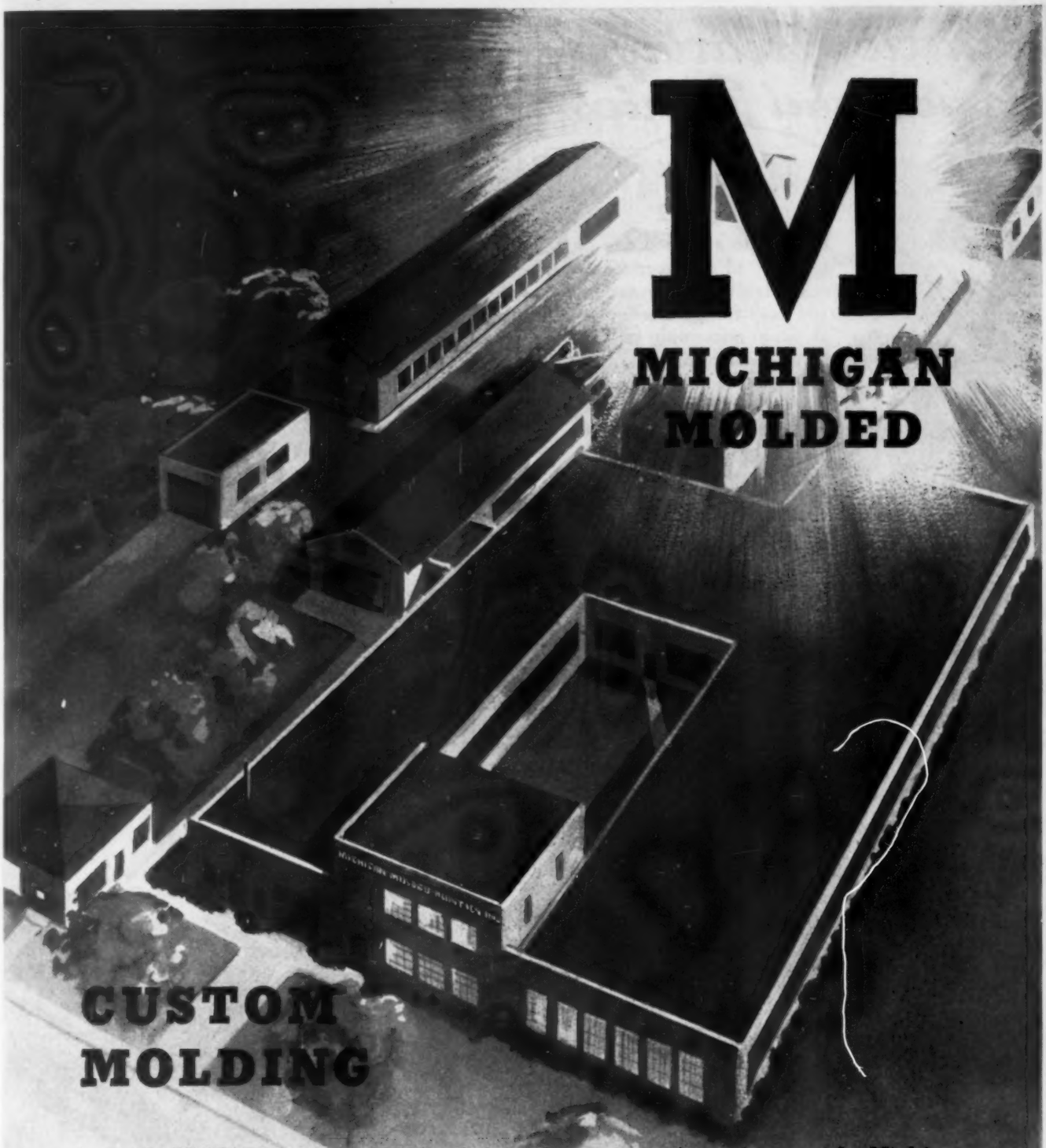
Company policies and practices—Porter-Cable Machine Co., Syracuse, N. Y., has just published a booklet which carries reprints of a series of articles appearing in the local press on the company's purposes, practices and policies in its relationships with employees, customers and community.

Efficient use of floor space—How to achieve co-ordination of all steps in materials handling at relatively low cost is described in a new booklet, "The Turner system of materials handling," now offered by Factory Service Co., 4615 N. 21st St., Milwaukee 9, Wis. Illustrations show scientifically engineered handling methods and specially designed units for efficient operation. Among subjects covered are the concentration of materials within easy reach of operators, vertical and horizontal expansion, practical stacking and storing, the elimination of waste motion in handling and the use of movable transports, bin sections, racks, pallets, etc.

Case and carton sealing—National Adhesives, 270 Madison Ave., New York City, has issued a booklet, "Successful case sealing," which promotes better case and carton sealing. It is a revised edition of a previous brochure, "Seal that case," issued several years ago. New sections highlight post-war developments in the use of synthetic resin adhesives for domestic as well as export case sealing, and in the use of Load-Lok for unitized and palletized glued loads. Other sections describe improved methods of applying shipping labels and way bills to all types of container surfaces.

Covinylblak BA—In Bulletin No. 137 just released by Binney & Smith Co., 41 E. 42nd St., New York City, Covinylblak BA, a dispersion or masterbatch of a high color carbon black in vinyl resin, is described. Its advantages are said to be faster compounding of carbon black, cleanliness, enhanced jetness, better gloss and economy in carbon black content.

Humidity control—A colorful eight-page booklet, "Humidity control is more important in your plant than you realize," has been released by Surface Combustion Corp., Toledo 1, Ohio. It explains the principle of operation and details of application of



CONSIDER, if you will, these advantages of working with Michigan Molded: (a) Moderate in size, your problems and your order receive the constant attention of top executives. (b) These men possess many years of experience in plastics including engineering and production talents that have solved some mighty touchy problems, and (c) a plant that can't be topped, run by the good men of the good little town of Dexter, Michigan.

Your inquiries are sincerely invited.

MICHIGAN MOLDED PLASTICS, INC. DEXTER, MICH.

the Kathabar system of selective humidity control for industrial processing applications. The flexibility of the operation is illustrated by a chart giving the various temperature-humidity conditions available from the system, as it might be applied to one large processing plant.

Rotary cutters—A profusely illustrated booklet showing the various sizes and types of rotary cutters put out by Ball & Jewell, 22–28 Franklin St., Brooklyn 22, N. Y., has been released by this company. These cutters are adapted to plastics materials and are said to meet any grinding requirement from small experimental purposes to large volume production.

Die-less duplicating—O'Neil-Irwin Mfg. Co., Lake City, Minn., has announced a 40-page catalog, No. 47–12, which gives the latest information on the company's system of Die-less duplicating. It contains illustrations and specifications covering all Di-Acro benders, brakes, shears and rod parters which can be employed individually or cooperatively for the precision production of a wide variety of parts.

Safety tools—Safety Tool Catalog 118, released by Ampco Metal, Inc., 1745 S. 38th St., Milwaukee 4, Wis., describes hand tools available for use in hazardous locations. The tools are recommended for use in the presence of explosive liquids, fumes, gases or dust as a safety measure. They are non-magnetic, rustless and corrosion resistant.

Inverted pumps—Two new pumps, the Septuplex and Nonuplex, have been added to the company line of inverted Triplex and Quintuplex pumps, according to a release from the Aldrich Pump Co., Allentown, Pa. With these additions, the line now covers pumping units from 15 to 2400 hp. The new pumps may be engine type, driven by a synchronous motor mounted directly on the pump crankshaft, or may be direct coupled to engines having speeds from 225 to 275 r.p.m.

Industrial design—"How to use an industrial designer" is the title of a new booklet issued by the Society of Industrial Designers, 48 E. 49th St., New York City. It answers questions concerning designers often brought up by businessmen.

Labels—Advantages of Kum-Kleen self-adhesive labels to the plastic and ceramic industrials are outlined in a two-color folder published by Avery Adhesive Label Corp., 36 W. Union St., Pasadena 1, Calif. Illustrations show uses various manufacturers make of labels.

Assembly presses—In Bulletin PA-47, Colonial Broach Co., Box 37, Harper Station, Detroit 13, Mich., shows its expanded line of hydraulically operated assembly presses. The line comprises models from 10- to 50-ton capacity.

Punch press care and use—A new booklet illustrated in cartoon style entitled "Punch pointers," has been announced by Richard Brothers Div., Allied Products Corp., at 4640 Lawton Ave., Detroit 8, Mich. It gives the do's and don'ts of punch press set-up and operation as well as proper care and use of R-B interchangeable punches and dies.

Tool steels—In a release just put out by the Carpenter Steel Co., 312 W. Bern St., Reading, Pa., announcement is made of the addition of three air hardening tool steels to the company's matched set. These steels are recommended for jobs where minimum distortion in heat treatment and elimination of hardening hazards are essential.

Method of die cutting—How to die cut flat plastic sheets, metal sheets, soft woods, other soft and semi-soft materials by using a steel rule die method is explained in a pamphlet just released by Accurate Steel Rule Die Mfrs., 24–26 W. 21 St., New York City. Press preparation and procedure is included.

ALL PHOTOS, COURTESY ROHM & HAAS CO.

Finished two-color die-cut acrylic inlay sign is especially effective when it is back lighted

Multi-color die-cut signs

ACRYLIC multi-color signs which may be back lighted for unusual effects can be produced in quantity by using a new die-cutting method developed by the Rohm and Haas Model Shop. A variety of combinations can be obtained by selecting suitable colors of clear or translucent Plexiglas sheets. This method has the advantage of no material waste.

The size of the design produced is limited by the size of available presses and by the fact that unequal expansion or contraction in either the cut-out section or the blank may result in appreciable difficulties of fit. Signs up to 2 ft. square, however, are entirely practical

Design is die-cut from sheet of white acrylic

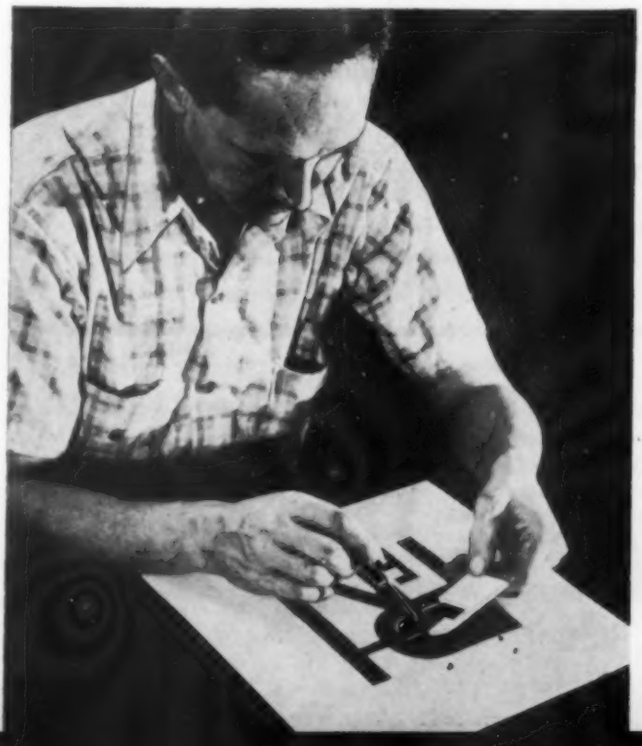
and larger signs can be made by modifying the technique.

The shapes of the letters or designs which are to appear in one color on a ground of another color, are cut from a heated ground sheet by a steel rule blanking die. The letters or designs are then cut with the same die from a heated sheet of the second color and inserted in the ground sheet by reheating both ground and figure to forming temperature.

The sign is then cooled in a jig designed to provide slight lateral pressure on the edges of the ground sheet and enough pressure on the top to keep it flat. When cool, cement is applied with a camel's hair brush or hypodermic syringe to the joint between figure and ground. It enters the joint as a result of capillary attraction.

Identical design is die-cut from sheet of red acrylic. Use of same die insures uniformity

Parts of design cut from red sheet are fitted into corresponding openings in white blank



The Plastiscope*

INTERPRETATIONS OF THE CURRENT NEWS

BY R. L. VAN BOSKIRK

Plastics in autos

Following is a brief report on some aspects of the plastics situation in the automotive industry, based largely on interviews between a MODERN PLASTICS *representative and members of the automobile fraternity in the Detroit area. It was not possible to include all companies in this report, and the reader will note that it is devoted largely to thermoplastic molding materials.*

The general feeling in the motor-car industry seems to be that molded plastics, for the present at least, have reached their peak on interior automotive applications; two companies emphasize that the public wants bright metal—lots of it—and that they are going to give it to them.

At one large plant where a drop in consumption of butyrate will take place due to the elimination from new models of the plastic radio grille and two large speedometer and clock bezel frames, involving 1½ lb. of material per car, the changing outlook on plastics is said to involve mainly styling considerations; little is said about misapplications. At General Motors, they still remember unfavorable experiences with plastics which took place several years ago, and their decision not to go in for plastics heavily in the 1948 models apparently is built around these experiences.

Acrylics seem to be holding their place. They appear to be the choice for outside hood ornaments, and for three-dimensional horn buttons.

Polystyrene pro and con—General Motors does not indicate any immediate intention of working polystyrene into interior appointments, but Nash seems to be heading in this direction, having cooperated in the development of Logoquant, a new material which is said to harden the surface of polystyrene, eliminate most of the electrostatic attraction of the material, and protect it against the action of certain cleaning agents.

There is no indication at present that any of the major manufacturers are planning to burst forth with a car having a plastic laminate body. There is apparently quite a bit of experimental work going on with polyesters and various types of filler materials, but it appears to be preliminary in nature and still far from the stage of actual use, although such things as fenders, panels, and even car tops are known to be getting a thorough testing. Some exception to this may be made in the case of non-pleasure cars, such as cabs, where there seems more possibility of using such materials as thermosetting laminates for door liners, kick plates, sun visors, etc.

One rather startling report by a material man was that there is some switch away from plastic laminate timing gears in favor of chain drives. He seemed to feel that this was due to lower cost rather than to any lack of satisfactory service by the laminate gears.

Cost as a factor—Price seems to be by far the greatest obstacle to a widespread use of laminates or some type of sheet

* Reg. U. S. Patent Office.

We disagree, Mr. Auto Manufacturer

THE ACCOMPANYING report on what the automobile people are saying about plastics is given because they are volume users, and it is our duty to record their statements for our readers.

Printing this information, as gathered by a MODERN PLASTICS reporter, is in no sense an endorsement of the viewpoints expressed. Indeed, we differ emphatically with many of the opinions.

In the first place, we question the idea that the automobile-using public is "fed up" on plastics. Just how did the auto makers ascertain the public's desire? Did they actually make a person to person canvas, or did that idea originate in the minds of a few engineers or stylists who are notorious for making changes just for the sake of change? In so far as we can find out, any notion that the public doesn't want plastics is bunk; there is every indication that consumers are now buying plastics merchandise in as big or bigger quantity than ever before.

Furthermore, we are curious as to just where all the "bright metal—lots of it" for decorating automobiles is going to come from. The domestic demand for steel is still beyond the ability of the steel industry to provide. In addition, our Government insists that increasing quantities of steel must be shipped to Europe to help rebuild those devastated countries and bolster the Marshall Plan. Are automobile trimmings more important?

In view of this steel shortage, we have a hunch that Mr. Auto Manufacturer will be casting covetous eyes at plastics before 1948 is over, even if he thinks the public prefers "bright metal."

The most shocking statement in the accompanying report is that chain drives are to replace laminated timing gears. Of all things that are scarce in this country, one of the tightest is chain drives. Also, we are under the impression that laminated gears have proved their superiority over a long period of years.

No, indeed, we are not going to cry in our beer over the sad fate of plastics in the auto industry. We just don't believe it will be sad. But we would like to throw out this little note for consideration. Why has a situation developed that would cause the motor industry folks to talk like this? Could it be that the plastics industry has failed to do a selling—and a reselling—job in the very field where it has so ably proved its usefulness over a long period of years?

WHEREVER you are . . . we're neighbors!

You can forget about distance barriers when you're looking for highest grade molded plastics, delivered *on time*, at competitive prices. That's because there's a General Industries man "just across your back fence" . . . ready and waiting to assist you in solving *any* plastics molding problem.

To customers in *every* direction of the compass, we've been providing the best in molded plastics . . . for more than a quarter of a century. Most of our first customers are *still* General Industries boosters, too, we're delighted to say. They've found from experience that the kind of production they get from GI meets *every* specification to a "T".

For the good old-fashioned neighborly service that adds up to accurately molded, smart looking plastics at low cost and *when* you want them, call for the General Industries representative. He'll be on your doorstep quick as a wink.

THE GENERAL INDUSTRIES CO.
MOLDED PLASTICS PIONEERS
Department PM • Elyria, Ohio

DETROIT: Phone Madison 2144 BUFFALO: Phone Grand 8567 MARION, IND.: Phone 2560-W CAMDEN: Phone 2218

The Plastiscope

plastic material in automotive interiors. There is such a great spread between the price of these materials and the fabrics now being used that there appears to be little chance that the former will be adopted in the near future.

Vinyls seem to be getting their share of attention, but except for vinyl butyral, used in safety glass, the materials are comparatively new, and automotive engineers are hesitant to accept them carte blanche without more experience. They bring up such out-moded excuses as tackiness, fading, and other well-worn complaints, most of which have been overcome by the better vinyl processors.

Among the most annoying complaints is that woven Saran seat covers are injurious to fur coats. Saran weavers think that this ghost has been pretty well disposed of by the development of new weaves; demonstrations show that this product is no more damaging to the coat of a wiggly passenger than other materials.

Molded and extruded vinyl is also edging into the automotive field with such applications as push buttons for door locks, pedal pads, fender edging, and many others. For a reporter to obtain a true perspective on this subject is almost impossible: the automotive folks deny any great use of it, but when a supplier is asked he can show evidence of big orders.

Phenolic molded materials have probably become stabilized in their automotive uses in wiring and electrical devices, but at several pounds per car, the total used in the nearly 5,000,000 cars and trucks produced in the United States and Canada this year would take a hunk of resin.

Also pertinent, especially for 1948, is the increasing demand for station wagons which use large quantities of adhesives and interior lining and upholstery requiring plastics materials. Fisher Body, for example, has added some 700,000 sq. ft. of body-building room for this purpose, according to press reports.

Following are some notes regarding present and projected use of plastics by specific companies.

General Motors: Will use acrylic for some knobs, handles, etc., as well as in three-dimensional horn buttons. Butyrate steering wheels, they admit, are still the best thing yet developed for this purpose. Oldsmobile may use an acrylic "Hydra-matic" emblem on the back of the 1948 model to replace a similar emblem now made of metal. They do not feel that a smooth, hard laminate would be acceptable for interior lining of doors on pleasure cars: they think the public prefers the feel of a fabric. Nor can they see laminates of any kind as superior to sheet steel for body and fender stock.

Ford Motor Co.: Not yet willing to talk. They are apparently eliminating some thermoplastic parts, yet it is significant they have one of the largest molding and fabric coating plants in the U. S., including an 80-oz. injection press.

Chrysler Motor Co.: Design program at Chrysler is not yet frozen. There may be a reduced use of plastics. The 1947 Chrysler uses a butyrate steering wheel and butyrate radio grille, but the latter may not be retained. Acrylic horn buttons, dials, and hood ornaments will probably be retained, and there may be some use of molded vinyl. A new acrylic stop light is under consideration.

Packard Motor Car Co.: Vinyl material is to be used on the interior of a new station sedan model. Formica laminate for cabs has been used for some time. Packard is also using "black light" instrument board illumination with cluster dials of methyl methacrylate.

Hudson Motor Car Co.: An extensive use of the double-shot injection molding technique, developed by Gits Molding Corp., Chicago, Ill., will produce plastic parts to be featured in the 1948 line of Hudson cars, it is reported. This method involves the production of a component, such as a dial face, which is then placed in another mold and used as an insert for a second shot in a contrasting color to fill in letters, numbers, etc. It will be utilized to produce the Hudson speedometer, clock face, radio dial, fuel and temperature gages, gear shift knob, and an optional horn button. Hudson will also offer optional horn buttons of acrylic, produced by the Gits Crystal Seal process of three-dimensional molding, and three decorative parts on the glove compartment and dash panel made by the same method. Gits will also continue to supply Hudson with an acrylic hood emblem for night driving.

Kaiser-Fraser Corp.: The 1947 model is using two large dashboard strips injection molded of acrylic, one containing the clock dial, the other the speedometer. The company has bought patent rights to the "Scarab" with a fiber glass body designed by Wm. Stout but have announced no plans for production.

Bookbinding adhesive

Polyvinyl acetate for bookbinding is being supplied in plasticized emulsion form, 55% solids, by Vinyl Products, Ltd., Butter Hill, Carshalton, Surrey, Eng. A thick compound holds the leaves of the book together without reinforcement so that a book one or two inches thick can be opened a full 360°. The edge of each sheet of the book becomes embedded in the film and, according to processors, the pages will not fall out because the film expands and contracts when the book is opened and closed.

Tack heads

A new use of ethyl cellulose is for heads for tacks. The heads can be made in different colors and we understand are intended for use in connection with electrical wiring. It is claimed they can withstand the impact of a 5-lb. hammer.

Ladies' razors

A smart little case for Razorette, a tiny woman's razor, is being produced and marketed by the Molded Insulation Co., 335 E. Price St., Philadelphia 44, Pa. To date approximately 500,000 cases have been molded to contain the razor. The price is $1.00.

An unusual molding job has been done on the snap catch wherein the undercuts are molded in and the parts are stripped from the mold. Production is made in 14-cavity injection type molds for each part. One pound of molding material will produce approximately 56 cases consisting of top and bottom halves.

Cellulose acetate, ethyl cellulose, and polystyrene have all been used for the case.

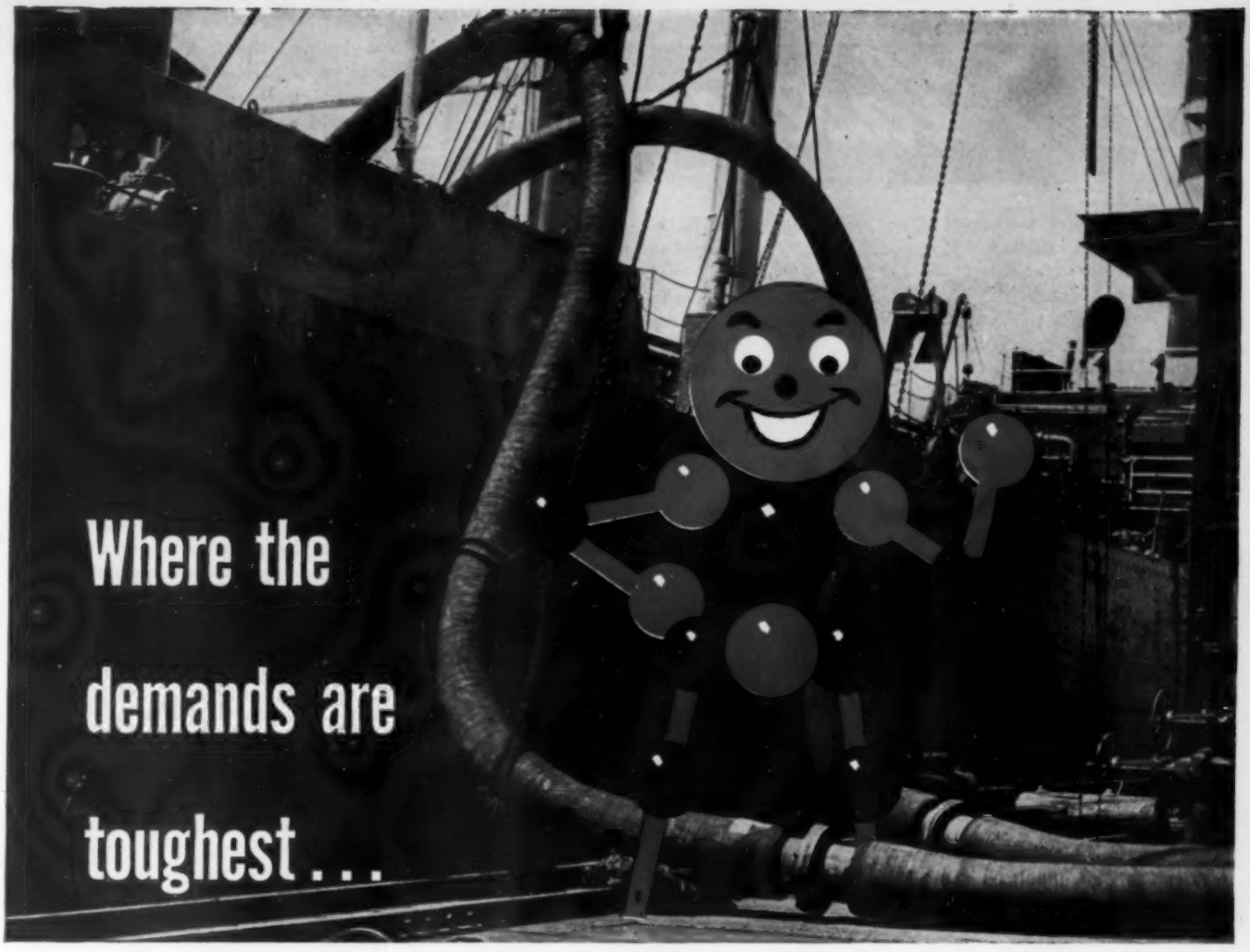
S.P.E. packaging committee

A national packaging committee of S.P.E. was organized at the Technological Institute of Northwestern University, Evanston, Ill., recently. The committee will help to provide specific information on the use of newly developed plastic films and other materials in the packaging field, particularly in the packaging of meats and frozen food products. Laboratory facilities of the Technological Institute are being made available to the committee. William L. Hess, Anesite Co., has accepted the chairmanship of the new committee, which will function under Carl Frosch of Bell Telephone Laboratories, national chairman of the S.P.E. consumer specifications-committee.

Birthday presents

"If I were buying a birthday gift for a friend of mine, I know of no better remembrance than that $1.00 set of A.M.G. Products Co.'s refrigerator bags," purred the lady over the radio in Pittsburgh.

Nothing happened for several days, but within a week orders started coming in to A.M.G. Products Co. of McKee's Rocks, Pa., and they are now distributing several thousand boxes a week. There are six



Hewitt chooses Perbunan!

STRICT DEMANDS are put on the inner lining of hose that loads or discharges oil and gasoline from tankers and barges. Oil suction and discharge hose must be made of a rubber that has *special* qualities to resist aging, flexing, oil, heat and cold, as well as other destructive and corrosive agents.

THAT'S WHY *Perbunan* was picked for the tube of "Monarch" Oil Suction and Discharge Hose by Hewitt Rubber Division, Hewitt-Robins, Inc. *By test and by use* Perbunan nitrile rubber has demonstrated its ability to resist oil, temperature extremes, flexing and aging. The Perbunan tube is specially compounded to handle high aromatic content fuels . . . provides smooth internal surfaces that minimize frictional resistance to flow.

PERBUNAN NOW CONTAINS a new stabilizer that permits it to be used in delicate colors where good color stability during service is desirable.

FOR EXPERT ASSISTANCE on *any* rubber problem you may have, please write to the nearest Enjay office.

PERBUNAN
REG. U. S. PAT. OFF.

THE RUBBER THAT RESISTS OIL, COLD, HEAT AND TIME

ENJAY COMPANY, INC., 15 West 51st St., New York 19, N. Y.; First Central Tower, 106 South Main Street, Akron 8, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Massachusetts. West Coast Representatives: H. M. Royal Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.

The Plastiscope

different sizes in a box, the largest of which will hold a dressed chicken. The set of six sells for $1.00.

The bags are made of polyethylene which is extruded as tubing and then expanded by air. They have metal clips to hold them tight after the top is folded over.

The company is also merchandising large size polyethylene bags for blanket storage which sell at three for $2.00. Another unusual use of large size bags is for buttermilk containers. One dairy company fills and heat seals them, uses them as one-trippers for large commercial users of buttermilk.

Nylon dinnerware

Bids for more than 105,000 pieces of nylon dinnerware, including dinner plates, bread plates, fruit dishes, soup bowls, and tumblers, were asked for in November by the U. S. Veterans Administration.

The VA expects to use them in most of its 126 hospitals and homes and hopes to have delivery by the latter part of 1947 and the first few weeks in 1948.

New organic chemical

Details concerning B. F. Goodrich Chemical Co.'s new Good-Rite chemical, beta-Propiolactone, announced in last month's **Plastiscope,** are beginning to come through. Its discoverers believe this new chemical may some day rank in importance with acetylene, alcohol, and other basic organic chemicals. It is relatively new, having been discovered in 1915, but has not been practical for commercial exploitation until a recently discovered economical method of production was found.

The lactones are a chemical family in the same respect as alcohols, acids, aldehydes, and ketones. Just as methyl and ethyl alcohols are the simplest members of the alcohol family and, therefore, the easiest to use and most practical for volume production, so is beta-Propiolactone the simplest member of the lactone family and the easiest to use. It is made by combining formaldehyde and ketene, the latter being derived from either acetone or acetic acid. Its great value to the chemical world will be its use as an intermediate in the preparation of other chemicals, and it is noted particularly for its great chemical reactivity.

Significant possibilities—beta-Propiolactone has several significant possibilities for the plastics industry:

1) The reaction of beta-Propiolactone with alcohols followed by dehydration constitutes a new and convenient method of making acrylic esters such as methyl, ethyl, and butyl acrylates. Acrylic esters are presently made by other companies and widely used as monomers and co-monomers in manufacturing numerous plastic compounds—such uses are generally held confidential and are little known outside of the chemical plants in which they are used. (These acrylic esters should in no sense be confused with methyl methacrylate, the principal constituent of presently merchandised acrylic molding powder and sheeting.)

The use of acrylic esters as co-monomers is becoming more and more widespread, and beta-Propiolactone provides an extremely simple method of making them.

2) Succinic acid, a dibasic acid which is gaining favor in the preparation of new polyesters for use in alkyd type resins, may be conveniently prepared from beta-Propiolactone.

3) Another use in the plastics industry might be in the preparation of acrylyl chloride, which can be reacted with glycols or polyhydric compounds to form a variety of new thermosetting resins possibly useful for laminating and casting.

4) beta-Propiolactone might be useful for the economical synthesis of a whole series of acrylamides for possible use as co-monomers in preparation of new type synthetic rubbers and resins.

Polyethylene price reduction

Bakelite Corp. has reduced prices of polyethylene from 4 to 7 cents per lb. for the various grades. This price reduction is the second for Bakelite polyethylene in less than six months and the fourth since mid-1942, bringing the new price level to a point more than 60% lower than it was at that time. The reduction in prices has been made possible by steadily increasing production and use of polyethylene.

Plastic-paper combination

A heat-sealable water vapor resistant packaging product made of polyethylene bonded to paper has been announced by the Plastics Film Corp., 475 Fifth Ave., New York City. Their "KasteK PE" is a cast polyethylene film of from 0.004 to 0.005 in. supported on papers ranging from 30 to 60-lb. basis.

The company has also brought out another product, "KasteK V," which is described as a 0.004 to 0.005-in. cast vinyl film supported on industrial paper from 30 to 100-lb. basis. The materials are available up to 60 in. on any paper of 30 lb. or more basis weight.

The great advantage of the polyethylene coated paper is that it offers an inexpensive water vapor barrier for use where metal foil was formerly necessary. Really good foil would cost from 60 to 70 cents a sq. yd., but the polyethylene coated paper can be obtained in large volume orders at a price of from 10 to 12 cents a square yard.

Both the polyethylene and vinyl materials have many uses: for example, in multi-wall bags or containers for agricultural products such as peat moss and alfalfa meal and for packaging food products of types like Jell-O where water vapor-proofness is particularly needed. Two unusual end uses are possibilities as a package for peeled potatoes and to prevent blue mold from forming on citrus fruit.

Newark S.P.E. gets heavy job

The Newark chapter of S.P.E. has been chosen as the agency for editing and supervising the inspection manual for plastics in conjunction with the Picatinny Arsenal plastic laboratories of the Ordnance Dept. of the Dept. of the Army. The manual will include mold design, molding, raw materials, and testing.

Koppers buys Chemaco

The Koppers Co., Inc. has acquired the stock of Manufacturers Chemical Corp. and its subsidiary, Chemaco Corp. The present management of Chemaco will remain unchanged, and production facilities will continue in Berkeley Heights, N. J., according to W. J. A. Connor, vice-president of Chemaco.

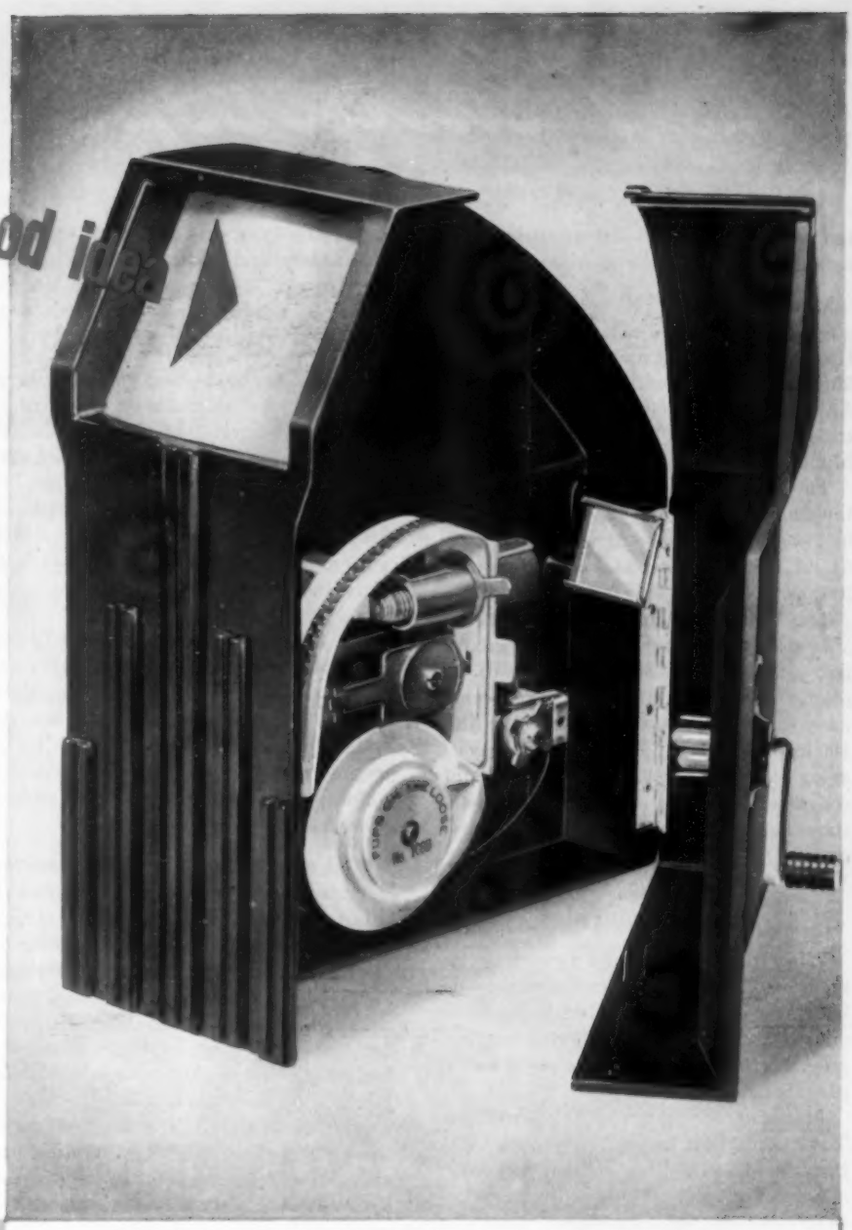
Stick to glass

Glasstic, a polyester compound furnished in almost any color and which will stick to glass indefinitely, is now being made by the Homalite Corp., 11-13 Brookside Dr., Wilmington, Del. The material can be removed and replaced any number of times without leaving any marks to be cleaned from the glass. It appeared first on the market as colored cut-outs of ducks, rabbits, etc., which children could stick to mirrors. It is suggested as a material from which letters of the alphabet may be cut and put on windows for advertising or sign purposes. Glasstic has also been suggested as a covering for table tops and bars in homes and commercially.

Visking expansion

The expansion program of the Visking Corp. was recently given headlines in the Chicago press. According to the news story, the company's plant in North Little Rock, Ark., with 100,000 sq. ft. of floor space, was opened November 5 for the production of a non-woven fabric bonded with a plastic resin. The fabric has thus far been used primarily as a decorative packaging material but also has potentialities as a food package. Other uses for this non-woven fabric are for inexpensive window curtains, draperies, lamp shades,

take a look at a good idea IN RESINOX



Safe and simple enough for a child to operate, the Noma Tel-A-Show is not just a toy, but a real precision designed and engineered movie projector. Operating from ordinary flashlight batteries, the Tel-A-Show is an entirely self-contained unit . . . a dramatic advance in the field of home movie projection.

Because close tolerances, molding adaptability, production speed, strength, eye appeal and low cost were essential, Monsanto Resinox was chosen for the case which houses the unit. Important structural features and several metal inserts were embodied in the intricate two-piece molding. Resinox superiorities are proving themselves again in production and performance.

Check your products against the list of Resinox properties. They may be just what you need for more appeal . . . better profits and better sales. Get full Resinox information from: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. In Canada, Monsanto (Canada) Limited, Montreal.

Molded by Noma Electric Corp., Plastics Division, Holyoke, Mass., for Noma Tel-A-Show, Inc., N. Y.

8 Resinox properties you can capitalize on

1. Low cost	5. Permanent strength
2. Adaptability to intricate molding.	6. Exceptional electrical insulating properties
3. No costly finishing or coating operations required	7. Excellent resistance to chemicals, water, aging
4. High heat resistance	8. Compatibility with metal inserts

MONSANTO
CHEMICALS ··· PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

The Plastiscope

and aprons, in addition to industrial uses such as pipe coverings and wiping rags.

More container film—Visking also plans to increase capacity at their Terre Haute plant where it manufactures plastic film for use as a meat and food container. An additional 100,000 sq. ft. have been added to the main plant in the Clearing Manufacturing District.

The company expects to reach a record-breaking net income of $2,000,000 in 1947; in 1946 Visking reported net earnings of $1,192,766, equal to $3.02 on each of the 594,000 common shares outstanding.

The additional plant space made available will enable the company to exceed last year's production of 2,500,000 lb. of plastic film, fabric, and cord. The company now turns out a sheet of plastic film 108 in. wide. It is used not only for packaging but also for the customary vinyl film consumer products such as raincoats, shower curtains, and refrigerator bowl covers.

Sparkle sparkles

When B. O. Plenty and Gravel Gertie brought forth their long-haired blonde baby, they not only created a sensation among Dick Tracy's followers, but apparently they added another jewel to the plastics industry.

Manufactured by the Ideal Novelty & Toy Co., 200 Fifth Ave., New York City, Sparkle Plenty doll production will reach a total of at least 600,000 in the period of September through December. Gimbel's of New York City has already sold 76,000 and will probably sell 120,000 before the holiday season ends. The company is producing them as rapidly as possible with at least six presses working 18 hr. a day on doll heads of all types. They assert that any Sparkle doll which is finished during a day is shipped by midnight of that day.

Biggest hit in dolls—Sparkle is the biggest hit in the Ideal doll family since the "Magic Skin" doll came out about 1939. Sparkle is little different from the "Magic Skin" doll except that in addition to the "skin you love to touch," she has the "hair you love to stroke." At least 1,200,000 of these basic plastic type dolls will be made this year. Sparkle retails at $5.98.

Heads for Sparkle Plenty dolls are produced in 4-cavity dies at the rate of one head every 20 sec. by injection molding cellulose acetate butyrate. The eye frame is crimped into the plastic so that the eyes can't loosen and fall back into the head. About 2.2 oz. of material is used per head. The head pieces are cemented together permanently and coated with pyroxylin type lacquer. The body is rubber latex.

Synthetic rubber supply

There is an interesting comment in a recent issue of *Rubber Age* on the revision of Rubber Order R-1 which freed natural rubber for use in practically all non-transportation items. The writer calls it the initial step in the eventual battle of natural *versus* synthetic rubber and cautions a watchful look-out to note how many manufacturers change completely from synthetic to natural rubber.

The writer states when speaking of the future of synthetic rubber that "it is foolhardy to assume that the use of a product will not increase continuously when its availability has been guaranteed by a process which gives low cost, absolute uniformity, and freedom from violent price changes."

Back to rubber?—The rubber situation is particularly pertinent to the plastics industry because of the close competition for end products that is almost certain to develop in some categories. For example, many post-war molders of hard rubber goods who were forced to change to other materials have made no bones about the fact that they would go back to rubber just as soon as it was available because of the price situation. The competition in sheet and coated goods between rubber and vinyl is obvious, although the issue is considerably befogged because most of the large rubber companies have also gone head-over-heels into the plastics business. Although there is considerable rivalry in these large companies between their plastics and rubber divisions, policy is still controlled at the top, and nearly all of them very coyly state that there will be no competition.

It augurs well for the future of plastics industry when the big rubber companies tacitly admit its importance by throwing their hats in the ring; but it also brings strong competitors into the field with the unusual competitive position of being able to switch quickly from one material to another without seriously weakening their over-all strength.

Pipe lining and rubber coating

The Amercoat Div. of the American Pipe & Construction Co., Los Angeles 54, Calif., has developed a vinyl-lined steel pipe to permit the handling of strong chemicals in chemical plants, pulp and paper mills, and the like. The lining is extruded in the form of a tube with a thickness of from 0.050 to 0.060 in., placed inside a steel pipe, and bonded to it by a special process.

Another Amercoat product is used to coat rubber and cotton belting for use on conveyors subject to abrasion, spillage of water, grease, oil, and other chemical solutions and cleaning agents.

RUMORETTES

A British firm is planning to set up an establishment in the United States to coat glass cloth with vinyl chloride film. This firm is currently producing a substantial quantity of coated glass fabric in London but has no material available for export to this country. The company will coat material of gages running from 6 to 24—will coat either one side or both—and samples indicate that the finished product has an unusually dry hand and shows none of the usual signs of plasticizer migration. One of their better grade samples looks particularly impressive as a bookbinding which may be either printed or embossed.

It is rumored that the same firm plans to set up coating establishments in Czechoslovakia, France, and perhaps India. Company officials believe it may be possible for them to sell this material at between $1.25 and $1.50 a sq. yd. when they get into production.

A compound which is a combination of a flexible plastic binder and a metallic filler will soon be on the market. This material adheres tenaciously to all common metals, including aluminum, and is highly resistant to weathering and most common reagents. It appears useful as a sealant in the manufacture of such devices as aluminum refrigerators, prefabricated houses, and truck bodies.

Outside of molding materials, the largest poundage of phenolic resins is listed under the "All other, exclusive of protective coatings" column in the Census Bureau reports. In August that amount was almost 4,000,000 pounds.

We were interested to hear a producer state recently that the largest portion of this "other use" phenolics is going into a binder for mineral wool insulation. The market for mineral wool has been rapidly expanding since the war due to large industrial plant expansions and to low-cost housing where insulated walls and roofs make it unnecessary to build an attic.

Keep your eye on Good-Rite Resin 50, developed by the B. F. Goodrich Chemical Co. primarily for use in shoe soles, floor tiling, and as a rubber stiffener. It is said to be a high styrene and low butadiene copolymer in powder form, and experimenters have found that it has unusual properties. Some of them are using it to do the work once asked of polyesters in laminating, and they claim that it has

The Plastiscope

greater tenacity due to the butadiene content—one user says it sticks "like grim death to a dead Indian." When used as a laminating material with glass fabric, it is particularly applicable because it closes up the interstices more effectively, according to the experimenters. These same people also claim it can be used successfully for injection molding in competition with more brittle thermoplastics because it gives a tough and malleable product.

A new packaging material for dressed poultry is said to be practically ready for marketing. The new film is believed to be a combination of Saran and rubber latex.

British Industrial Solvents is reported planning to start manufacture of dioctyl phthalate early in 1948. At present, all d.o.p. used in Great Britain is imported from the United States.

A report has trickled into this office that ethyl cellulose film is now being produced on the East coast and being shipped to California for use in food packaging. First results are reported as good, especially the film's resistance to tear while it is going through the packaging machine.

A district representative of a raw materials company has asserted that he can increase the use of cellulose acetate next year by 200% in his district in applications other than for plastics, such as lacquer, synthetic textiles, and photography.

One of the oldest and largest floor covering manufacturers in the country who has been experimenting with vinyl floor covering for months is now definitely scheduled to announce it at the January Floor Covering Show, according to a usually well-informed source.

RAW MATERIALS

Adipol 2EH (di-2-ethylhexyl adipate), a new plasticizer for vinyl and other resins, has been announced by Ohio-Apex, Inc., Nitro, W. Va. According to company information, it possesses the unusual combination of extreme low temperature flexibility and excellent electrical properties; it shows better properties for these characteristics than any other plasticizer the company has ever tested. The material is a high boiling liquid plasticizer. A printed technical data sheet will be sent on request.

Amberlite W-1 is a new type polymer supplied as a 20% solution in water by the Resinous Products & Chemical Co., Washington Square, Philadelphia, Pa. The developers think it has great possibilities for a multitude of uses and are encouraging experimentation in laboratories of interested firms. It is stable, viscous, and infinitely water dilutable. Dry films have physical properties similar to casein but are extremely resistant to fungi and bacteria. Films dried in the range of 100 to 150° C. soften and are slightly soluble in water, whereas those dried at 200° C. are water insoluble. When dried at temperatures up to 100° C., the films are water sensitive and readily redissolved.

Films may also be insolubilized by metallic salts, and formaldehyde will cause rapid gelation or will insolubilize deposited films. Air dried films are clear, essentially colorless, and quite brittle. They show excellent adhesion to porous surfaces, but adhere poorly to nonporous articles. Glycerine, glycols, and sorbitol, in concentrations up to 20% of the composition, act as plasticizers and produce flexible films.

Preliminary tests reveal its value in the manufacture of wet strength paper; in adhesives; as a thickener for latices where its ability to be insolubilized by heat, formaldehyde, or metallic salts is important; in dipping processes; for emulsifying monomeric plasticizers and Paraplex resins; and for printing, sizing, and coatings of all types.

Plasticizer SC manufactured by E. F. Drew & Co., 15 E. 26th St., New York City, is currently receiving considerable attention as an all-purpose plasticizer to use with dioctyl phthalate. It has been especially recommended by several users as a desirable type of plasticizer to retain flexibility at low temperature. Its heat loss is good, and modulus of efficiency is reported as equal or superior to most other all-purpose plasticizers. Elongation is greater than the most commonly used plasticizers.

COMPANIES

Goodyear Tire & Rubber Co. has announced that it is making Pliofilm available to fabricators for use in shower curtains, rainwear, garment bags, and ladies' accessories. A rubber product, Pliofilm was used largely for airplane engine protection during the war and for food packaging since that time. Goodyear is now apparently placing it in direct competition with the vinyls for use in household accessories and wearing apparel fields.

American Cyanamid Co.'s *Plastics Newsfront*, its quarterly publication telling its customers about its plastics products, was awarded the Direct Mail Advertising Association's "Best of Industry Award." It was the prize winner for the best direct mail campaign in the plastics industry for 1946–47 and as such will be exhibited along with award winners in other industry classifications before advertising clubs, graphic arts groups, and similar organizations during 1948.

Shaw Insulator Co., Irvington, N. J., has made the following sales appointments: James W. Whitfield, 6321 32nd St., N. W., Washington, D. C.; R. L. Foote, Engineered Plastics, Inc., Gibonsville, N. C.; Lawrence H. Burns, Jr., L. H. Burns Co., 837 Potomac Ave., Buffalo, N. Y.; American Plastics Engineering Corp., 3020 East Grand Blvd., Detroit, Mich.

St. Regis Paper Co. has announced the opening of a new Panelyte district sales office in Minneapolis at 2016 Seabury Ave. It will serve Panelyte customers in Minneapolis, St. Paul, and the surrounding area. Herbert M. Giefer, district manager, will be in charge.

Announcement was also made of the appointment of Jann P. Nielsen, formerly with Woodall Industries, as a Panelyte representative in the Detroit district with headquarters in Spring Lake, Mich.

The B. F. Goodrich Co. has established a new Plastic Materials Sales Div. to handle sales of all company plastic materials, including Koroseal. General Manager of the new division is L. H. Chenoweth. Ernest Hookway has been appointed operating manager.

Herward-Ranger, Inc., Walpole, Mass., succeeds the Ranger Co. and the Herward Fabrics Co., with ownership and management remaining the same. The merger combines the cotton and rayon converting facilities of the Herward Fabrics Co. with the pyroxylin and resin type coating plants of the Ranger Co.

Celluplastic Corp., 50 Ave. L, Newark, N. J., large producers of plastic containers, and injection and extrusion molders of plastic packaging and other plastic products, has appointed the Allen-Nelson Co., 603 Boylston St., Boston, Mass., as New England representative.

National Plastics, Inc., Knoxville, Tenn., is now engaged in the production of molding materials using cottonseed hulls for a filler, with the molding compound sold under the trade name of "Plastone A." Working closely with the University of Tennessee where the development originated, National Plastics has an exclusive license from the University to produce cottonseed molding powders. A pilot plant was constructed in Knoxville and is now in operation under Dr. F. Rosenthal.

The Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York City,

The Plastiscope

has announced that construction of its new plant for the manufacture of phthalic anhydride at Ironton, Ohio, is going forward rapidly.

Industrial Synthetics Corp. has moved from Irvington, N. J., to larger quarters at 225 North Ave., Garwood, N. J. The organization extrudes Elastron flexible vinyl products such as belts, and Supplex plastic garden hose.

Linden Processing Co., Linden, N. J., has severed its connections with J. J. Brown & Co., Inc., who formerly acted as Linden's sales agents. The company does roller embossing on a custom basis and will take orders of any size providing the customer can use one of their stock patterns which are box calf, skiver, levant, colonial, and crepe pin seal. They will emboss vinyl unsupported film and all coated fabrics of 4 to 25-gage thickness.

Don Manning & Co. of Rochester, N. Y., manufacturer of tools and dies for plastics, has negotiated a contract with the Government of Haiti for the establishment of a plastic plant in that country. The contract is on an exclusive basis, extends over a 15-year period, and covers the manufacture of plastics and resins as well as conversion of same. The Don Manning Co. has agreed to put an investment of $100,000 into this project.

It is said to be the first time in the history of Haiti that such a contract has been signed between the Government and a foreign-born businessman.

The new plant will feature plastic products reflecting the tropical setting in which they are made.

C-Thru Products Co., Inc., writes to correct an error which appeared in its announcement in October. This company, which manufactures transparent sun blinds, has moved its plant to East Orange, N. J., but the general offices of the company are located at 69 Lincoln Park, Newark, N. J.

Plaskon Div. of Libbey-Owens-Ford Glass Co. has announced personnel appointments in connection with its new coating resin plant in Toledo, Ohio, now in preliminary production. C. Homer Flynn, sales manager of coating resins, will direct distribution of products from the new plant. O. P. Clipper is production manager, and K. D. Meiser has been appointed superintendent of production. Dr. J. Alden Murray is head of technical service, and Bernard W. Slater is manager of operations. The new coating resin plant has combined the former Long Island City operations with Toledo, Ohio, developments in synthetic resins.

PERSONAL

Gordon Brown, vice-president of Bakelite Corp., will speak to members of the Plastics Engineers Association in New York City, Dec. 15, at their annual Christmas meeting, on the philosophy of getting into the plastics business and how to stay in it.

William P. Gobeille, formerly chief engineer of the Cruver Manufacturing Co., 2460 Jackson Blvd., Chicago, Ill., has been promoted to works manager. Martin Silovich is the new chief engineer.

Dr. Laurence V. Burton has been appointed executive director of Packaging Institute, Inc., New York City, to succeed Albin Dearing who has resigned to enter into other work.

Robert Allen, formerly of Fisher Plastics Corp., and Ralph A. Nelson have jointly formed the Allen-Nelson Co. as manufacturers' agent, 603 Boylston St., Boston, Mass.

William L. Platt has been appointed Boston district sales manager for the Columbia Chemical Div. of Pittsburgh Plate Glass Co. He will maintain headquarters at the Little Bldg., Boston 16, Mass.

Arnold C. Martinelli, formerly sales manager for thermoplastic molding materials at Monsanto Chemical Co., will become general manager of Rogers Plastics Corp., North Wilbraham, Mass., effective January 1, 1948. E. L. Hobson, now assistant branch manager of Monsanto's New York office, will succeed Martinelli at that time.

Walter G. Tucker, chairman of the board of the Hydraulic Press Mfg. Co., from 1933 to 1945, has been returned to that position, following the recent resignation of H. A. Toulmin, Jr.

Dr. James J. Pyle, director of General Electric Co.'s Plastics Div. laboratory in Pittsfield, Mass., has been elected to the Board of Directors, Locke Insulator Corp.

Addison E. Wiles, formerly assistant manufacturing manager of the General Electric Co.'s Plastics Div., has been named manager of the Pittsfield Molding Products Works, Pittsfield, Mass. Mr. Wiles succeeds Arthur C. Treece, who is now assistant manager of the new General Electric plastics laminate plant located at Coshocton, Ohio.

American Anode, Inc., Akron, Ohio, has opened a new plant in Los Angeles, Calif. The company handles latex mixes and compounds of many types in both natural and American-made rubbers as well as synthetic resins.

Dr. Paul O. Powers, technical adviser of the Battelle Memorial Institute, Columbus, Ohio, has been elected chairman of the Div. of Paint, Varnish, and Plastics Chemistry, American Chemical Society.

Edmund Greene has been appointed sales promotion and advertising manager of the Merrimac Div. of Monsanto Chemical Co. The Merrimac Div. has headquarters in Everett, Mass., with sales offices in Boston.

Rufus F. Wint has been named a new technical sales service representative to Hercules Powder Company's Cellulose Products Dept. branch office in Detroit, Mich. In addition to his work with protective coatings and plastics, Mr. Wint has been a member of the faculty of the lacquer schools conducted by Hercules at its Experimental Station. In his new post he will assist Phil F. Robb, manager of the department's Detroit office.

The Houts Memorial Fund committee reports that contributions have been made for a paid-up educational policy for Everett Hout's son amounting to approximately $2500. The late Everett Houts was allocations officer for the Chemicals Div. of WPB during the war.

Walter Wagner, formerly with All-Plastics Corp., and T. P. Heider have formed the Heider & Wagner Corp. with offices at 140 Cedar St., New York City.

Mr. Wagner was chief of the Molding and Laminating Unit, Plastics Branch, War Production Board during the war.

Heider & Wagner Corp. is a sales unit for plastic products, developing and engineering plastic items for syndicates and chain stores, advertising promotions, and packaging. Edwin D. Maibrunn is the company specialist on plastic products for advertising.

W. L. Mitchell, formerly with Chicago Molded Products Corp., has joined Tybond Products Co., 2435 N. Western Ave., Chicago, Ill., as sales manager.

MEETINGS

January 12–16, inc.—National Materials Handling Exposition to be held at the Public Auditorium, Cleveland, Ohio, will feature topics of interest to the plastics industry.

January 21–23—S.P.E. National Conference to be held at Horace H. Rackham Educational Memorial, Detroit, Mich.

February 16–17—S.P.I. of Canada at Mt. Royal Hotel, Montreal.

PHOTO, COURTESY CELANESE CORP. OF AMERICA

Acetate bead bases give simulated pearls higher luster, greater uniformity, less weight

Simulated pearls

MORE lustrous simulated pearls made up in new designs featuring multi-strands are providing a New Look in the necklace field. The why and how are answered in the bead bases which are made of Lumarith instead of the hitherto used glass.

Among the costume jewelry companies employing these plastic cores is Coro, Inc., of New York City. Teckna Co. of Bayside, L. I., N. Y., and Tell Mfg. Co. of Newark, N. J., are the extruders.

The use of cellulose acetate gives many advantages—most important of which is light weight, allowing more strands and more lavish designs without uncomfortable weight. Too, the cores have a natural affinity for the lustrous pearl essence, which clings to the plastic core without flaking or chipping and requires no buffing to produce the desired irridescence.

Manufacture of cores to exact-scale dimensions is still another asset. The surface is smooth, round, and free from blemishes or distortion. Since the holes are produced as part of the extrusion process, their diameter can be kept uniform and they can be placed in the exact center of the bead base. As a result, the beads hang evenly when strung.

Wall tile adhesive

ESPECIALLY designed for applying polystyrene tile to walls, an entirely new type of adhesive mastic has been placed on the market by Adhesives, Inc., Plainfield, N. J.

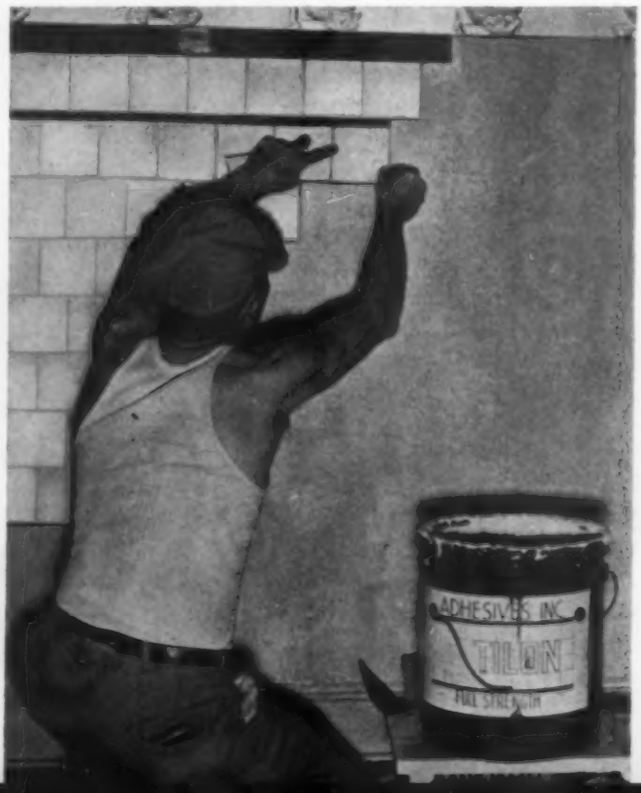
The new adhesive, called Tilon, employs a synthetic resin base, which is the secret of the maker. This base is compounded with dry fillers to the right consistency so that it may be troweled on. It is white in color, mild in odor, and weighs approximately 15 lb. per gal., which is the amount that will cover about 50 sq. ft. of wall area.

The makers claim that it is easy to apply in a one-day operation; is easily cleaned off the tile surface; has good wet strength to hold the tile in place until the adhesive sets; gives good adhesion to polystyrene, wood, metal, concrete, brick, plaster, wallboard, and painted surfaces; will have no softening, etching, or scratching action on the tile which will affect the strength or gloss of the surface; is highly resistant to moisture and water; can stand a temperature from 30 to 180° F.; has permanent resilience to withstand the shifting and setting which occurs in all buildings; and is fireproof.

Tilon is applied to the wall surface with a sawtooth trowel having teeth at least $\frac{1}{8}$ in. deep. The tile is then pressed onto the mastic with a sliding motion to insure complete contact between tile and adhesive.

Tests are currently under way to determine other qualities and to establish best methods of application.

New adhesive for applying polystyrene wall tile provides good adhesion to wood, metal, concrete, brick, plaster, or painted surfaces



There's a new day coming—sure as you're born. New products, new processes, new developments are in the making—with highest quality basic materials figuring prominently in the finished results.

And heavily counted upon by industry—*now* as in the past—is the broad line of WITCO basic materials. All Witco products are quality-controlled . . . all are continually refined and improved whenever possible by constant research and pilot plant activities. All are made to furnish something of fundamental importance to the character of an end-product.

Let Witco help get your products off to the best possible start in the competitive era ahead. Request literature and samples.

WITCO CHEMICAL PRODUCTS FOR THE PLASTICS INDUSTRY

DRY COLORS • WITCARBS • METALLIC STEARATES • CARBON BLACKS • MICA • TALC

WITCO CHEMICAL COMPANY

MANUFACTURERS AND EXPORTERS

295 MADISON AVENUE · NEW YORK 17, NEW YORK

BOSTON • CHICAGO • DETROIT • CLEVELAND • AKRON • LOS ANGELES
SAN FRANCISCO • LONDON AND MANCHESTER, ENGLAND

Macerated fabric phenolic

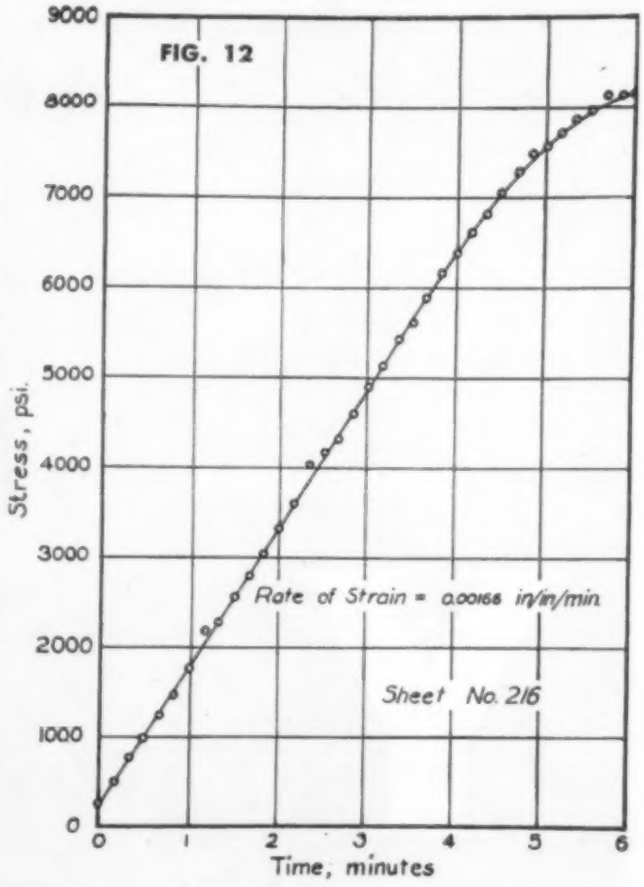
(*Continued from page 150*) a member subjected to torsion is equal to the maximum shearing stress. Therefore, the values of maximum shearing stress obtained from the torsion test of a hollow specimen should be nearly equal to the tensile strength of the same material as obtained in a tension test, instead of one half the tensile strength.

The hollow specimens were tested at several different rates of strain as were the solid specimens. Results of the former, however, do not correlate well, probably because of the fact that the size of the discontinuities in the material itself were the same order of magnitude as the wall thickness of the hollow section.

No measurable variation in shearing modulus of elasticity with change in rate of strain was observed. The modulus of elasticity in shear as obtained from the average slope of the curves shown in Fig. 10 was 290,000 p.s.i. The value reported above for the other set of tests was 234,000 p.s.i. The difference between these two values is possibly due to the fact that the specimens in the two tests were obtained from different sheets. All specimens used for the solid tests shown in Fig. 10 were obtained from the same sheet.

Static bending tests (flexure)

Flexural tests were performed on specimens shown in Fig. 2d. A four-point loading system was employed



12—*Sample stress-time curve for the bending test*

It's tops for table tops!

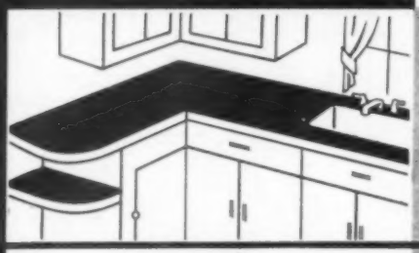
When you score PLYON* on the three basic counts of handsome appearance, wearability and low cost, it shapes up as an ideal surfacing material for tables, counters, drain boards, furniture and work benches. Here are the reasons . . .

Plyon stands up under hard usage. The bonding and impregnating resins used in making it were chosen to provide all the essential properties of a good surfacing material. Consequently, Plyon is tough—it's scuff-proof, chip-proof, soap-proof and waterproof. The sleek, colorfast surface doesn't dim or suffer from the attacks of most acids, alkalis, greases or oils.

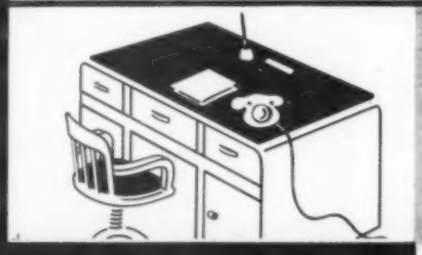
Plyon is beautiful to look at. It's produced in a variety of attractive patterns and colors that make it equally at home in boudoir, kitchen or laboratory.

Plyon costs less per unit area. Why? . . . Because you don't waste money in buying a heavy gauge when a lighter one will do the job . . . and Plyon can be obtained in gauges ranging all the way down from one-tenth to one-hundredth of an inch. Yet, regardless of thickness—or thinness—there's no variation in the quality of the surface.

While we've just skimmed the surface of the Plyon story here, your letter will enable us to give you detailed information on Plyon's adaptability to your specific needs.



Plyon is tops for sink tops and kitchen working surfaces. Neat, trim, colorful . . . its smooth surface doesn't dent or scratch easily, washes with soap and water.



Plyon is tops for desk tops. Available in rich wood-grain patterns. Plyon won't crack or warp, wears better than ordinary wood veneers. It scoffs at ink stains, and can be cleaned with a quick wipe of a damp cloth.

*Trade Mark Registered.

Swedlow PLASTICS CO.

5527-33 District Blvd. • Los Angeles 22, Calif.

Sole foreign distributors:
Omni Products Corporation, 460 Fourth Avenue, New York 16, N. Y.

by means of a beam-and-linkage arrangement so as to produce a constant bending moment in the center portion of the specimens. The average result of five specimens showed a modulus of rupture in bending of 8000 p.s.i. These tests were performed in such a way that the rate of strain of the extreme fiber was about the same as in the tension and compression test reported in Tables I and II; that is, the rate of strain was about 0.0015 in./in./min. The rate of strain for the bending tests was obtained by plotting a stress-time curve. From this curve and the known value of modulus of elasticity the rate of strain was computed. A sample stress-time curve for the bending test is shown in Fig. 12 (p. 218). These tests show modulus of rupture in flexure is about twice the static tensile strength, and about two thirds the static compressive strength.

Impact tests

Impact tests were made on specimens of both the Charpy and Izod type on specimens (Figs. 1c, d) machined from two different slabs. The results of these tests are presented in Table V. Four specimens of

Table V.—Impact Tests of Phenolic Molding Material

Type of test	*Sheet 311*		*Sheet 314*		*Average for both sheets*
	Specimen	*Absorbed energy*	*Specimen*	*Absorbed energy*	
		in.-lb.		*in.-lb.*	*in.-lb.*
Izod—Notch parallel to original surface	I-4	22.0	I-4	18.0	
	I-3	20.0	I-3	21.3	
	I-2	19.0	I-2	20.8	
	I-1	18.0	I-1	13.0	
Average		19.3		18.3	18.8
Average deviation from the mean		1.2		2.8	
Izod—Notch perpendicular to original surface	I-8	21.5	I-8	21.5	
	I-7	21.7	I-7	21.8	
	I-6	22.0	I-6	20.8	
	I-5	20.0	I-5	20.8	
Average		21.3		21.2	21.2
Average deviation from the mean		0.6		0.4	
				Average of all Izod tests	20.0
Charpy—Notch parallel to original surface	IC-4	14.8	IC-4	21.3	
	IC-3	14.2	IC-3	17.8	
	IC-2	18.7	IC-2	14.5	
	IC-1	19.9	IC-1	17.5	
Average		16.9		17.8	17.3
Average deviation from the mean		2.4		1.8	
Charpy—Notch perpendicular to original surface	IC-7	14.4	IC-7	13.4	
	IC-6	11.8	IC-6	14.6	
	IC-5	13.5	IC-5	15.8	
Average		13.2		14.6	13.9
Average deviation from the mean		1.0		0.8	
				Average of all Charpy tests	15.6

5 GREAT ADVANTAGES . . . 3 EASY STEPS

G-E PLASTICS PREHEATER

Generating heat quickly and uniformly throughout the entire plastics preform by a 40-megacycle electronic field, the G-E 5-kw plastics preheater affords these five outstanding advantages to every molding shop with its simple 1-2-3 operation.

1. Increased production — electronic preheating saves warm-up time in mold, giving production increases up to 75 per cent:

2. Reduced scrap losses—uniform dielectric preheating minimizes surface-crust formations on preforms.

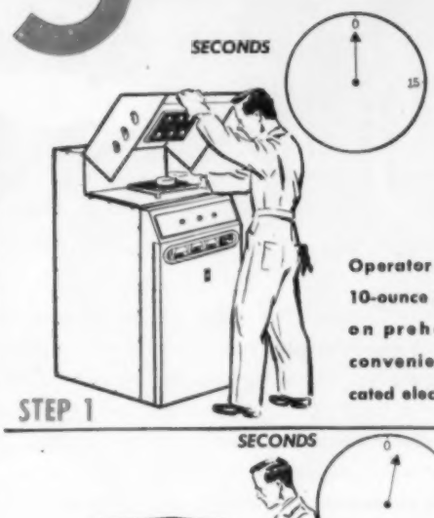
3. Lower finishing costs—thinner flash on mold parting line makes finishing operations easy, quick.

4. Reduced material costs—less expensive compounds previously considered impractical are made easy to mold.

5. Accelerated curing time—uniform chemical reaction initiated before molding.

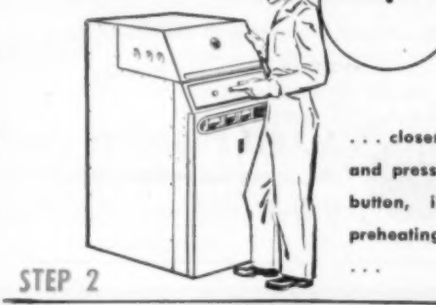
The G-E plastics preheater couples these major operating benefits with a job-tested construction which incorporates all the requirements for heavy-duty, high-production industrial use. Low on maintenance and high in efficiency, this preheater offers a flexible means of obtaining all the cost- and time-saving advantages of dielectric preheating.

Get in touch with the Heating Specialist in the nearest G-E Office. He will be glad to discuss this modern production tool with you. And, in the meantime, send for free descriptive bulletin GEA-4623A, "G-E 5-kw, 40-megacycle Plastics Preheater." *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*



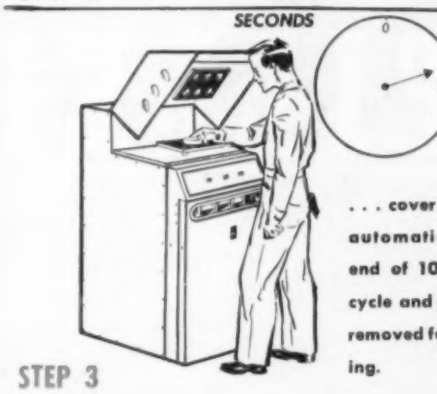
STEP 1

Operator places 10-ounce preform on preheater's conveniently located electrode...



STEP 2

. . . closes cover and presses start button, initiating preheating cycle . . .



STEP 3

. . . cover opens automatically at end of 10-second cycle and preform removed for molding.

LOOK FOR THESE DESIGN FEATURES

- Sturdy Mechanical Construction
- Minimum Floor Space
- Portability
- Accessibility for Maintenance
- Two Timers
- Complete Safety Features

GENERAL ELECTRIC

675-156

Apparatus Department, Sect. A675-156
General Electric Company
Schenectady 5, N. Y.

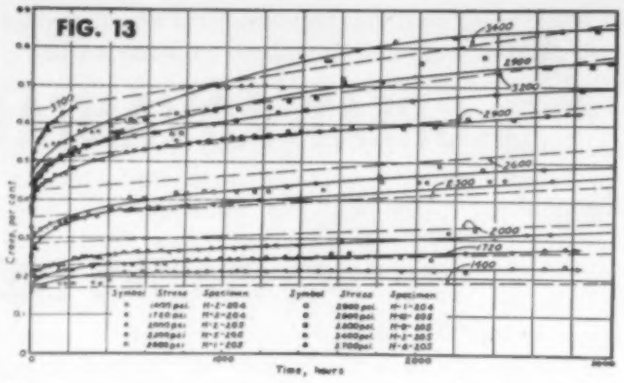
Please send me free bulletin GEA-4623A, "G-E 5-kw, 40-megacycle Plastics Preheater."

Name .....

Company .....

Address .....

City ..... State .....



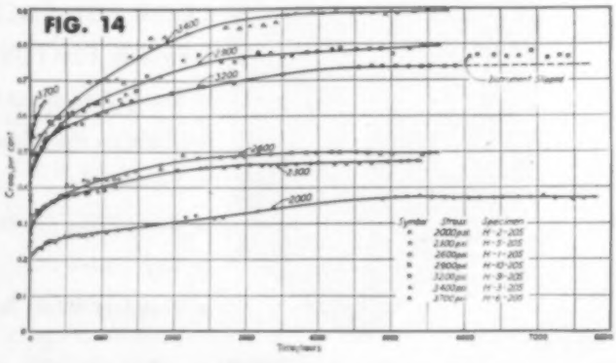
13—Creep in percent is plotted against the elapsed time in hours for a total of 3000 hours

each type from each slab were tested with the V-notch parallel to the molded surface of the sheet, and four specimens of the Izod type and three of the Charpy type were tested with the V-notch perpendicular to the molded surface. The values of energy absorbed by each specimen are given in Table V together with the averages and the average deviation from the mean. Very little difference was observed between values obtained from the two different sheets. It is perhaps worthy of note that the differences between tests with notch perpendicular and notch parallel to the original surface are not consistent between the Charpy and Izod tests, indicating that the impact strength of the material was substantially independent of the position of the notch.

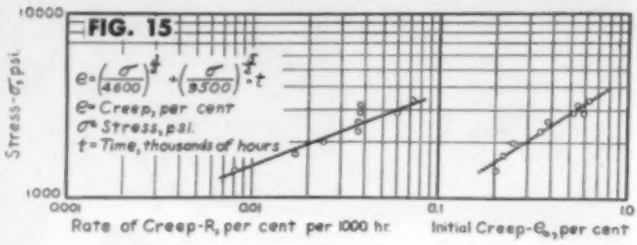
The average of all the Izod tests is 20.0 in.-lb. for the $^1/_2$-in specimen, which is about 20% greater than the average of all Charpy tests. The average of all Charpy tests is 15.6 in.-lb. The difference is perhaps due to the fact that in the Izod tests an appreciable amount of energy is absorbed in a scraping action between the striking edge of the tup and the specimen.

Creep tests

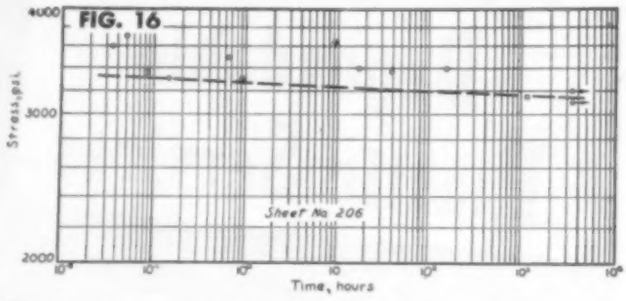
Creep tests in tension were performed at stresses ranging from 1400 to 3700 p.s.i. Strain readings were taken at intervals of time over a period of as much as 8000 hr. for some of the tests, and shorter periods for other tests. In Fig. 13 creep in percent is plotted



14—Creep in percent is plotted against the elapsed time in hours for a total of 8000 hours



15—Initial creep is expressed here as a power function of stress



16—Tension stress plotted against time for fracture on a log-log scale

against the elapsed time in hours for a total of 3000 hours. A similar diagram for a time of 8000 hr. is shown in Fig. 14 (p. 222). Creep, as usually defined, is the total change in length (including elastic stretch) between gage points located in the cylindrical portion of the specimen expressed as a percentage of the original distance between gage points.

A rapid rate of creep is observed during the first interval of time. During this period the rate of creep decreases and is followed by a long period of creep at a relatively uniform rate. This latter period is referred to here as the "first stage" of creep. The initial portion of decreasing rate of creep is referred to as the "first transition region." The scatter in the plotted points for some of the tests is probably due in part to the difficulty of measuring changes in length of such small magnitudes and in part to the effect of intermittent vibrations of the building or to occasional short-time interruption of the air-conditioning equipment. The rate of creep after about 3000 hr. decreases appreciably, so that the curves approach nearly to a horizontal line for all values of stress (Fig. 14). This tendency is similar to that observed for relatively high stresses in the case of cellulose acetate.[2]

The creep at any time within the limits of the test and at a given stress can be approximately represented by a straight line of slope R and intercept e_0; thus, $e = e_0 + Rt$ where e_0 is the "initial" creep, R the rate of creep, and e the total creep at time t. The values of e_0 and R are obtained by drawing a straight line through the points representing the first stage of creep (Fig. 13). The slope of this line is the rate of creep R during the first stage of creep, and the intercept of this line with the zero-time axis is the initial creep e_0. When the rate of creep is plotted as a function of the stress on a log-log

diagram (Fig. 15 (p. 224)), it is found data thus plotted can be represented reasonably well by a straight line, so that the rate of creep can be expressed as a power function of the stress. Similarly, the log-log plot of stress against initial creep is nearly a straight line, so that the initial creep can also be expressed as a power function of the stress (Fig. 15).

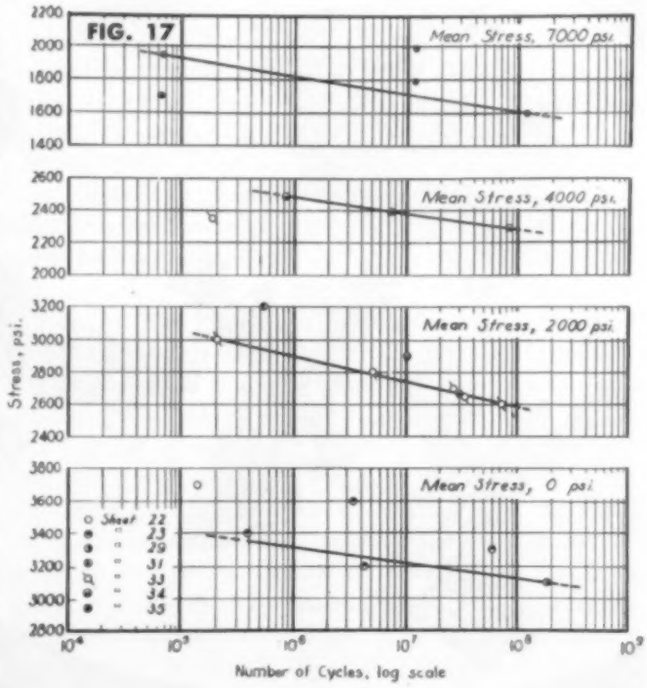
Thus it is possible to express creep at any time t and any stress σ, by the following relationship (the numbers "4600" and "9500" are dimensional coefficients):

$$e = \left(\frac{\sigma}{4600}\right)^{3/2} + \left(\frac{\sigma}{9500}\right)^{5/2} t$$

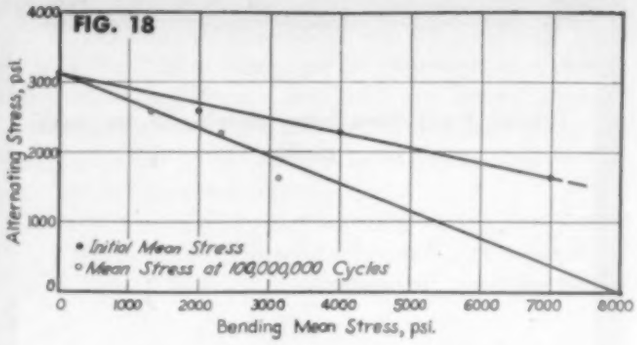
This equation is, of course, an approximation to the creep curve. It represents a family of straight lines having slopes equal to the slope of the creep curve in the first stage and passing through the creep curves in the first stage. The family of straight lines represented by the above equation is shown, for the values of stress used in the tests, as dash lines in Fig. 13. Exact agreement between these lines and the plotted data is not to be expected because of the scatter of the plotted points shown in Fig. 15. The dash lines shown in Fig. 13 obviously will not accurately represent creep in the first transition region nor during the "second stage" of creep. In these cases, however, the actual creep is less than that predicted by the equation, so that use of the equation would be on the safe side.

Fracture under constant load

These tests were supplemental to creep tests. The time required to cause fracture under a constant tension load is shown in Fig. 16 (p. 224); the tension stress is plotted against time for fracture on a log-log



17—The four different values of mean stress are shown in this σ-N diagram



18—Fatigue strength at 100,000,000 cycles plotted against the mean stress of the cycles

scale. Above a stress of about 3200 p.s.i., fracture almost always occurred within a relatively short time (less than 100 hr.), but below this stress no fracture occurred in less than 2000 hours. Figure 16 indicates that the time required for fracture to take place under a constant stress increases with decrease in stress and that in the neighborhood of 3200 p.s.i. a relatively small change in stress may make a very large change in time for the fracture to take place.

Fatigue tests

Effect of range of stress on fatigue strength in bending—In this paper "range of stress" is defined in terms of two quantities, the mean stress and the alternating stress of the stress cycle; that is, the cycle of stress is resolved into two components: a constant or *mean* value of bending stress σ_m and an alternating stress σ_a, which is superimposed on the mean stress. When the mean stress is not zero, the corresponding value of maximum alternating stress σ_a which will produce fracture after a given number of cycles of stress is defined as the fatigue strength for that value of mean stress and the given number of cycles of stress.

Fatigue tests of the phenolic molding material were run on specimens shown in Fig. 3a for four different ranges of stress. The σ-N diagram for the four different values of mean stress is shown in Fig. 17 (p. 226). In this figure the alternating component of stress is plotted against the number of cycles for fracture on a semilog diagram. An appreciable scatter of data is observed in these tests, so that a definite σ-N curve cannot be drawn. For purposes of analysis, a straight line is drawn through the plotted points representing the trend of the curve. The greatest emphasis is placed on tests at large numbers of cycles in drawing this line. In order better to illustrate the effect on the fatigue strength of a change in the mean stress, the fatigue strength at 100,000,000 cycles is plotted against the mean stress of the cycles shown in Fig. 18. It is observed fatigue strength decreases with increasing mean stress from 3130 p.s.i. at zero mean stress to 1610 p.s.i. at a mean stress of 7000 p.s.i. (Table VI, p. 230). The speed of testing used in all of these tests was 1720 c.p.m.

During the conduct of the tests in which the mean stress was not zero, it was observed that the mean stress

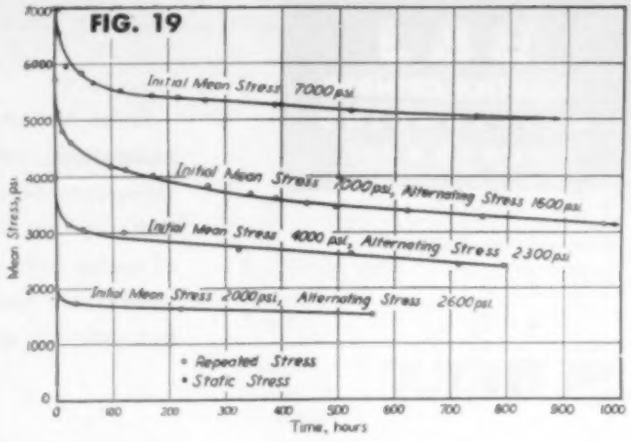
Table VI.—Fatigue Tests of Phenolic Molding Material

Sheet number	*Specimen*	*Type of test*	*Speed of testing*	*Initial mean stress*	*Mean stress at 10^8 cycles*	*Fatigue strength[a] at 10^8 cycles*
			r.p.m.	*p.s.i.*	*p.s.i.*	*p.s.i.*
22, 23, 29	Square (Fig. 3a)	"Range" of stress in bending	1720	0	0	3130
31, 33, 34	Square (Fig. 3a)	"Range" of stress in bending	1720	2000	1330	2580
33, 34	Square (Fig. 3a)	"Range" of stress in bending	1720	4000	2320	2280
34, 35	Square (Fig. 3a)	"Range" of stress in bending	1720	7000	3140	1610
47	Circular (Fig. 3b)	Bending of circular specimen	1720	0	. . .	3820
47	Circular (Fig. 3b)	Torsion of circular specimen	1720	0	. . .	1800
301, 302	Circular (Fig. 3c)	Rotating beam: effect of speed	1720	0	. . .	2630
302, 303	Circular (Fig. 3c)	Rotating beam: effect of speed	4200	0	. . .	2300
303	Circular (Fig. 3c)	Rotating beam: effect of speed	6150	0	. . .	2050
304	Notched (Fig. 3d)	Rotating beam: effect of notch	6150	0	. . .	2300

[a] Tensile stress except for specimen from sheet 47 which showed shearing or tensile stress.

continuously decreased even though the deflections of the specimen were maintained the same. This decrease in mean stress (relaxation) was the result of creep of the material. In order to show the effect of relaxation on the alternating-stress versus mean-stress diagram (Fig. 18), the fatigue strength is plotted against the value of mean stress which obtained at 100,000,000 cycles. These data are shown by the open circles in Fig. 18. The average value of the "static" ultimate strength in flexure (modulus of rupture), obtained in tests reported above, is plotted on the diagram in Fig. 18. A straight line drawn between the fatigue strength at zero mean stress and the "static" bending strength represents the "theoretical" effect of mean stress.[3] It

[3] "Effect of range of stress on the fatigue strength of metals," by J. O Smith, Univ. of Ill. Bull. No. 334, 39 (Feb. 1942).

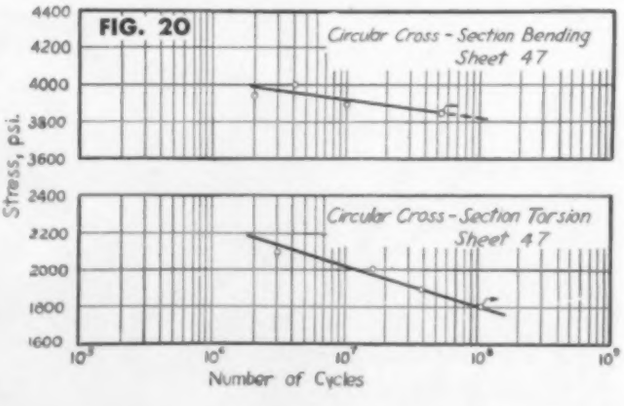


19—Initial mean stress plotted against time in hours and values obtained during fatigue tests at three different ranges of stress are given here

is observed that the data adjusted to the mean stress at 100,000,000 cycles fall very nearly on this straight line.

Relaxation during fatigue tests—The effect of relaxation was further studied by means of a relaxation test conducted under static conditions in which the initial value of the bending stress was 7000 p.s.i. This test was conducted by using dynamometer and specimen exactly the same as that used in the fatigue test. A deflection was given to the specimen sufficient to produce 7000 p.s.i. Readings of stress were recorded at intervals of time for a period of 800 hours. These data are plotted in Fig. 19 in which stress is plotted against time in hours. The value of the mean stress which obtained during fatigue tests at three different ranges of stress is also plotted in Fig. 19. These data are taken from the specimen which failed most nearly at 100,000,000 cycles. Relaxation of stress is quite rapid during the first 100 hours. Thereafter the stress decreases nearly as a linear function of time. The rate of decrease of mean stress increases with the value of the mean stress.

Fatigue strength in torsion and bending—In order to determine the behavior of the molding material in fatigue under a different state of stress, the material was tested in torsional fatigue. The σ-N diagram for fa-

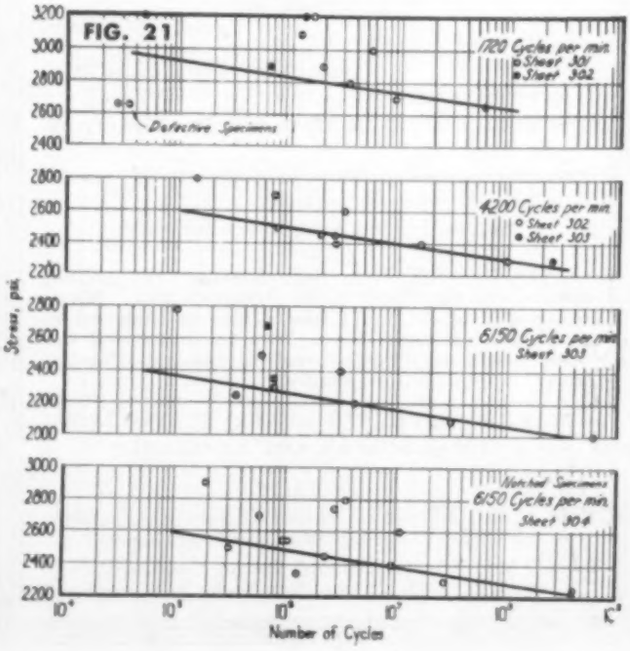


20—σ-N diagram for fatigue tests in torsion of round specimens

tigue tests in torsion of round specimens (Fig. 3b) is shown in Fig. 20 (p. 232). For comparison, a fatigue curve was also obtained in bending with the same circular cross-sectional specimen as used in torsion and with specimens from the same sheet. The σ-N diagram for these tests is also shown in Fig. 20. The fatigue strength for torsion tests is found to be 1800 p.s.i. shearing stress (see Table VI). The corresponding fatigue strength in bending is 3820 p.s.i. tensile stress. The fracture of the torsion specimen progressed along a 45° helix, indicating that the crack progressed along a plane of maximum tensile stress. However, the tensile stress in the torsion specimen is the same as the shearing stress, namely, 1800 p.s.i. at the fatigue strength, whereas the tensile fatigue strength in bending is 3820 p.s.i. This indicates that the start of the fatigue crack probably was the result of a shearing stress rather than a tension stress, because the maximum shearing stress in the bending specimen was one half the maximum tensile stress, or 1910 p.s.i. Thus it would appear that the failure is governed by the shearing stress rather than by the tension stress.

Effect of speed of testing on fatigue strength—The effect of speed of testing on the fatigue strength of the phenolic molding material was studied by use of rotating-cantilever-beam machines (specimen, Fig. 3c). These machines were provided with a V-belt drive, so that different speeds could be obtained. The σ-N diagrams obtained from tests at three different speeds—1720, 4200, 6150 c.p.m.—are shown in Fig. 21. The effect of speed of testing is found by plotting the fatigue strength at 100,000,000 cycles against the speed in cycles per minute (Fig. 22, p. 236). The fatigue strength decreases as the speed is increased over the range of speed studied. The fatigue strength at a speed of 1720 c.p.m. as obtained in these tests, is 2630 p.s.i. (see Table VI);

21—σ-N diagrams obtained from tests at 1720, 4200 and 6150 c.p.m. are shown



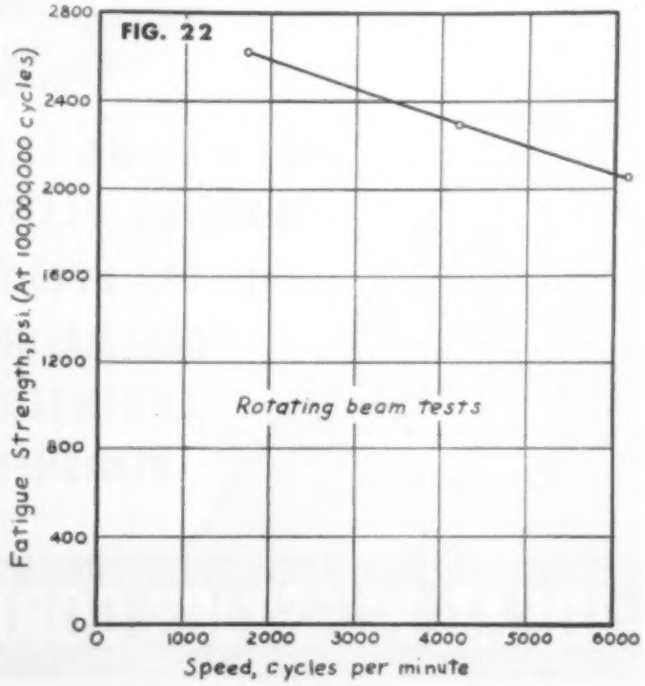
It may be that the effect of speed on the fatigue strength is in part due to rise in temperature of the specimen due to the internal friction in the material. Since the specimen was rotating during the tests it was not possible to measure the temperature; however, observations indicated that the temperature rise was not excessive.

Effect of a notch on fatigue strength—The effect of a notch of shape as shown in Fig. 3d was obtained by tests on a rotating-beam machine at a speed of 6150 c.p.m. The σ-N diagram for this test is shown in Fig. 21. The fatigue strength at 100,000,000 cycles is 2300 p.s.i. Comparing this with the test of the smooth specimens at the same speed, the fatigue strength is about 15% higher for the notched test than for the unnotched test (see Table VI). It is difficult to explain an increase in fatigue strength as a result of notching the specimen. It may be, however, that this apparent increase is due largely to variations in the material between sheets or scatter in the data. However, the conclusion that this material is relatively insensitive to notches seems justified. This is in opposition to results of tests of cellulose acetate,[4] inasmuch as the fatigue strength of a notched specimen for cellulose acetate was found to be about one half the fatigue strength of the unnotched specimen.

Effect of type of test and shape of specimen—Comparison of the fatigue strength obtained at a speed of 1720 c.p.m. and a mean stress of zero, but with different types of machine and different shapes of specimen, show the following results: The fatigue strength of a square specimen in the bending machine is 3130 p.s.i., while for a circular cross-sectional specimen the fatigue strength

[4] "Mechanical tests of cellulose acetate," by W. N. Findley, Proc. A.S.T.M. *41*, 1231 (1941); MODERN PLASTICS *19*, 57 (Sept. 1941).

22—Fatigue strength at 100,000,000 cycles plotted against the speed in cycles per min. gives the effect of speed of testing



is 3820 p.s.i., an increase of about 21 percent. A circular cross-sectional specimen of the same shape but tested in a rotating-beam testing machine has a fatigue strength of 2630 p.s.i., 31% below that of the circular bending specimen. These differences may be due in part to the variations in the material, particularly in the case of the latter since the rotating-beam specimens were obtained from material 0.5 in. thick and the bending specimens from materials 0.3 in. thick. Difference in surface finish may also contribute to the variation between results obtained on different machines. The original molded surface remained on all square cross-sectional specimens, whereas the surface of circular cross-sectional specimens was machined and then sanded. A similar increase of fatigue strength of circular as compared to square specimens was found for cellulose acetate.[5]

[5] "Mechanical tests of cellulose acetate," by W. N. Findley, Trans. A.S.M.E. *65*, 479 (July 1943); MODERN PLASTICS *20*, 99 (Mar. 1943).

Fillers

(*Continued from page 132*) important as applications increase where color and great strength are required. The history of these developments began with the incorporation of chopped cotton cloth with a melamine resin. No effort was made at first to provide a wide range of colors and the compound was supplied in natural, white, brown, or black. Now, a range of standard bright colors is also marketed. Cotton cloth was obtained, chopped to size, and sufficiently cleaned to permit the establishment of a color range which was as uniform as possible. An important factor concerning the chopped cotton cloth fillers is that extreme care has to be taken to be sure that only neutral colored cloth is used. After molding, a distinct mottled pattern is apparent in the finished piece. On the other hand, such a filler provides good shock resistance, and can be colored easily. In addition, this type filler does not impair the electrical characteristics of the resin itself.

Some time ago, certain manufacturers found it desirable to develop a cotton flock filled melamine molding material, in order that a more uniform and homogeneous surface be obtained. This compound gives a surface in a molded part which, although still mottled in appearance, is much more even and regular than the chopped cotton filled compound. From a manufacturing viewpoint, it is easier to control color and reduce contamination in this formulation. The material has lower bulk factor and is therefore easier to mold, retains good shock resistance, and provides a very satisfactory surface on a finished part.

Experimental work has been conducted with glass, various wood pulp and other fillers, but thus far demand or economic conditions have not brought about the commercial development of such products.

All classified advertising payable in advance of publication. Minimum, $5.00 (up to 40 words); in border, $10.00 per inch

Classified Advertisements

For further information address Classified Advertising Dept. MODERN PLASTICS 122 East 42nd St., New York 17, N. Y.

WANTED: Research chemist, knowledge and experience in paint, resin, varnish, plastic, paper coating, saturating, productions and engineering; under forty; capable of independent work; can assume responsibility for group of chemists; become associated with most progressive company. Write employment manager, Clopay Corporation, Clopay Square, Cincinnati 14, Ohio.

FOR SALE: 1-Thropp 16" x 36" motor driven Rubber Mill; Stokes type 200 Automatic Molding Press; Stokes Rotary Preform Tablet Machines 1-3/16", 1-1/8" and 5/8", Injection Molding Machines 2 oz. to 12 oz.; Baker Perkins jacketed Mixers 100, 50, 20 & 9 gals. capacity; New Rotary Cutters; Rubber Mills; Calenders, Banbury Mixers, etc.; HPM 500 ton Molding Presses 42" x 48"; Field 500 ton 25" x 30"; Francis 200 tons, 24" x 18"; Thropp 175 ton 36" x 36", 6 opening; also 20 to 250 tons from 12" x 12" to 36" x 36"; 40 ton Broaching Press; Watson-Stillman Hor. 4 Plgr. 1" x 2" x 4" H. & L. Pressure Pumps; HPM 1½" x 6" vertical triplex 10 GPM 2700 lbs.; 7 Hydr. Oil Pumps, Vickers, Oilgear, Norhern, etc.; Elmes 1" x 4" & 1½" x 4" hor. 4 plgr. 5 to 8 GPM 4500 lbs. & 5500 lbs.; Elmes 2" x 6" hor. 30 GPM, 2500 PSI.; Rumsey 4½" x 8" vert. Triplex 65 GPM 900 lbs.; Elmes 2½" x 4" hor. 17 GPM 850 lbs.; Hydro. Steam Pumps; Low Pressure Pumps 150 to 600 lbs.; Hydr. Accum; Heavy duty Mixers; Grinders; Pulverizers; Gas Boilers; etc. PARTIAL LISTING. WE BUY YOUR USED MACHINERY. STEIN EQUIPMENT CO., 90 WEST ST., NEW YORK 6, N. Y. Worth 2-5745.

FOR SALE
11—Stokes Preform Presses "R", 2 1/2"; DDS2 Rotary 1-3/16" RD4 Rotary, 1"; Colton Rotary 35 Punch 0/4"; 1—Day 150 gal. Jacketed Double Arm Mixer. Day Readco from 4 to 30 gal. Double Arm Mixers; 2-Ball & Jewell #0; #1 Rotary Cutters. BRILL EQUIPMENT COMPANY, 225 West 34th St., New York, New York.

INDUSTRIAL DESIGN Associates—offering complete product design, development and model building service. Would like live wire representation for services offered—Exclusive territories available. Home office located in eastern metropolitan area—Attractive commission basis to start. Reply box C505, Modern Plastics.

PRODUCTION CHEMIST—with experience in the manufacture of Phenolic moulding powder. Must have ability to supervise men and get production results. Excellent opportunity for right man. Plant located in Middle West. Box C507, Modern Plastics.

WANTED TO BUY: Cellulose acetate parts from stock molds; 1" and 2" diameter balls; scottie dog or other animal figures, approximately 1½" long. Reply Box C504, Modern Plastics.

FOR SALE
Hydro Pneumatic Accumulator, 13 Gal. 3500#. 25 Ton "C" Frame Type. High Speed Self Contained Hyd. Press —300 ton New Hobbing Press with Pump—Racine Pumps, Boosters, Valves, Logan Pumps, Valves. Self Contained.—200 H.P. 78 Gal. 3000# Pump. 200 H.P. 200 Gal. 1500# Pump, 18" x 15' Accumulator 1500#.—15" x 11' Acc. 400-2000". 6" x 9' Accumulator-2000#. 300 Ton Press 20" Ram, 8" Stroke, 24" x 20" Platen. 500 Ton—1000 Ton Hobbing Press.—Hele Shaw Variable Pressure 33 GPM 2500#—Vickers Oil Pumps 17 GPM 500 to 1000#. Elmes Horo. 4 Plunger 6 1/2 Gals. 5000#.—Stillman 12" x 12" Laboratory Presses. Aaron Machinery Co., 45 Crosby St., NYC.

DISTRICT SALES MANAGER with excellent contacts in midwest anxious to affiliate with large company on commissioned representation. Experienced in sales of compression, injection, laminated and extruded plastics and rubber. Give complete facilities and commissions paid. Reply Box C506, Modern Plastics.

WANTED DISTRICT sales manager for New York Metropolitan area for extrusion, compression molding, blow molding and fabrication. Include qualifications in initial correspondence. Box C503, Modern Plastics.

THOROUGH PROFESSIONAL advice, scientific or applied research on synthetic resins and plastics by Fred F. Pollak, Ph.D., 114 East 32nd Street, N. Y. C.

MANUFACTURERS REPRESENTATIVES WANTED
Large Eastern Seaboard compression, jet and transfer custom molding corporation desires representatives in the principal cities throughout America. Largest tonnages and capacities in the area. Capable of all large piece, high impact and specialized molded parts, radio cases, industrial applications, housings, gears, etc. Representatives must be high caliber men with good present working connections. All inquiries will be held strictly confidential. Reply Box C501, Modern Plastics

SALES ENGINEER, wanted to solicit custom molding for well established N. J. compression molder. Knowledge of Engineering important. Commission Basis. Reply Box C498, Modern Plastics.

FOR SALE: Complete wood flour mill in the East. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, address Box C499, Modern Plastics.

WANTED POSITION in charge research or production of phenolic resins for molding, lamination, water soluble, grinding wheel, brake-lining, plywood, paint varnish and lacquer types. Have many new formulas especially fast curing low cost molding compounds. Twenty seven years in research, development, management and sales. Desire permanent job have been consulting will take full charge. Box C500, Modern Plastics.

FOR SALE TUBERS AND EXTRUDERS: 1—Nagel 10½", 1931 model, heavy duty water-cooled worm and barrel, removable die holder, double reduction cut spur gears, base for 100 HP motor. Entirely rebuilt. 1—Allen 6" tuber, thoroughly rebuilt with new double reduction cut spur gears, water cooled worm and barrel. 1—Adamson 6" tuber, double reduction cut spur gears, water cooled worm and barrel. Rebuilt. STEWART BOLLING & CO., INC., 3190 E. 65th St., CLEVELAND 4, OHIO

WANTED—Finishing Room Foreman for large Midwestern Injection Molding Plant. Five years experience required. Reply Box C458, Modern Plastics.

FACTORY REPRESENTATIVE
wanted for the Atlantic Seaboard to handle Nationally Advertised line of chemicals in the fabrication of lucite and plexiglas. Box C495, Modern Plastics.

PLANT MANAGER desires permanent connection with firm handling thermoplastics. Solid background in the various phases of plant operation, engineering, planning and cost control. No swivel chair executive, but able to train personnel, to organize and get things done. Will also consider association with financially responsible party to establish new plastics enterprise or to expand existing plant facilities. Reply Box C494, Modern Plastics.

MANUFACTURERS AGENTS wanted: Quality Durashield all Plastic Stationer and Office items—In and Out Time Indicator Board, Office Door Clock, Business Hours Sign, Transparent Sheet Protectors, Credit Card Holders, Signs & Nameplates. Advertising literature available. Address all inquiries to—I. M. Montalto, Plastic Fabricators Co., 440 Sansome Street, San Francisco, California.

SALES EXECUTIVE
Nationally known eastern manufacturer of organic industrial chemicals now entering resin field requires thoroughly experienced sales executive for new development and marketing program. Must have degree in chemistry or chemical engineering and sales experience in phenolic resins. Salary to $10,000.00 per year. Write fully, giving experience, education, age, present salary, and location requirements. All replies treated in strictest confidence. Box C490, Modern Plastics.

WANTED: PLASTIC Scrap or Rejects in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

MANUFACTURERS REPRESENTATIVE successfully handling a top nationally known line, toys and sporting goods, is now in a position to take on another line for Eastern territory calling on Jobbers, Chain and Department Stores. Maintains New York Showroom. Thoroughly familiar with Plastics. Box C496, Modern Plastics.

SISAL FIBERS
Cut to size, samples and prices on request. Tru-Cut Co., Box 341, Rahway, N. J.

PLASTIC ENGINEER, Practical Experience. Thoroughly familiar with Models, Part Design, Mold Design and Engineering. Hub Making Mold Repair and Redesign. Consultant on Injection Molding. Have been in actual charge of all of these departments and can perform the work as well as supervise. Box C497, Modern Plastics.

ATTENTION—MOLDERS & FABRICATORS
We are a selling organization, in direct contact with national and independent chains—drug, variety, hardware and department stores. We can sell your output, taking all selling problems off your hands. We carry our own accounts or will represent you on a commission basis. NORTON DISTRIBUTING CO., 304 S. Dearborn St., Chicago 4, Ill., Telephone Wabash 9518.

SWISS MANUFACTURER and sales representative desires to represent well established USA firm in raw materials and chemicals for Plastic Manufacture, Cellulose acetate and other plastic materials, powder, sheets. Highest references furnished. USA Manufacturer desiring to find important openings on Swiss and European market. Reply Box C508, Modern Plastics.

WANTED: Manufacturers to produce and distribute newly designed items for Children's Retail Stores Association and better class Department Stores. Want Display Stork in clear and pastel colors, Baby bathette, Beginners cup, Baby Powder Puff, Nylon Netting, Treasure Chest, Toy clock, etc. Patents applied for. Want Samples for early 1948 Showing. Write—Mary Bradley, Children's Retail Stores, Chesterton, Indiana, Box 32R1.

BUSINESS OPPORTUNITY IN HAITI
We have exclusive contract with the Government of Haiti to establish a plant for the manufacture of all plastic articles. This is an opportunity to earn great returns while you enjoy living in a tropical paradise, where labor is very cheap and living cost low. Partner with equipment and some capital may take active part if desired. Don Manning & Co., 135 Leighton Ave., Rochester, N. Y.

WANTED FOR export to Switzerland following Plastic raw materials and resins: Polyvinyl chloride acetate, Polyvinyl acetate, Polymethacrylacis ester, Polystyrene, Polyethylene, Phenolic resin, Cresol resin, Urea resin, Melamin resin, and Alkyd resin. Swiss Manufacturer furnishes highest references. Reply Box C493, Modern Plastics.

You'll get better plastic products

at WATERTOWN

When you're in need of plastic parts, large or small, of intricate or simple design, you'll do better at WATERTOWN. Here you'll find experience of some thirty-five years of supplying the plastic requirements of some of the nation's leading industries. Here too is the finest equipment available to handle the custom molding of thermo-setting or thermoplastic materials. A complete testing laboratory is available in order to make your products *better* than most. We shall be happy to assist you in any way possible. Send us your difficult problems and be assured of the finest service. . . .

THE WATERTOWN MANUFACTURING COMPANY
1000 ECHO LAKE ROAD WATERTOWN, CONNECTICUT
NEW YORK CLEVELAND CHICAGO DETROIT MILWAUKEE

Watertown
A NAME AS OLD AS THE PLASTICS INDUSTRY

FOR SALE—5,000 lbs. Clear Acetate Molding Powder Celanese 0-3528H XGMS @ 42¢ lb.
881 Sheets .040" Clear Nitrate Drafting Material Stock @ $2.00 per sheet.
13,500 Sheets .005" White Opaque Acetate AA finish @ 50¢ sheet.
Prices F.O.B. Chicago. Box C491, Modern Plastics.

PLASTIC EXTRUSION ENGINEER WANTED If you are a mechanical engineer and have had plastic extrusion experience, here is your opportunity to become associated with the development dept. of a pioneer, midwest, plastic co. Reply stating age, experience, salary requirements, etc. Box C492, Modern Plastics.

DO YOU NEED a Hydraulic Press for Compression Molding, Transfer Molding, Laminating, Forming, Bending, and Hobbing? Many sizes hydraulic presses and pumping units available. New motors from 2 to 7½ H.P., 220 volts, 3 phase. Whatever it may be, if it is hydraulic, see Sal-Press Company, 388 Warren Street, Brooklyn, N. Y.

FOR SALE: Angle Molding Hydraulic Press Watson-Stillman, suitable for Split Molds and for Molding Complicated Parts by the transfer method. 3 horizontal double acting rams, 13½", 8" and 6" arranged in "T". Reply Box C132, Modern Plastics.

FOR SALE or Trade—Used injection molding machines 4 ounce H.P.M., 6 ounce Watson-Stillman, 9 ounce H.P.M. Would like to trade for 8 ounce Reed-Prentice injection molding machine. Reply Box C467, Modern Plastics.

FOR SALE—1—Watson Stillman Hydro-Pneumatic High and Low Pressure System, complete with pumps, tanks, boilers, etc., for 3000# operation. 2—Baker Perkins 100 gallon Plastic Mixers. 1—12" x 12" Press 7" Ram. Steel Heated Platens and Hand Pump attached; 1—24" x 24" Adamson, 10" ram, 2-opening Hydraulic Press; 1—24" x 24" Farrell 10" ram, 2-opening Hydraulic Press; 1—30" x 30" D&B, 2-open, steel heated Platens 12" ram; 2—La Pointe Hydraulic Pumps, 150 G.P.M.—2000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press, 9" ram; 6—Hydraulic Presses, 20" x 20", 12" x 14"; Dry Powder Mixers; Pulverizers, Grinders, etc. Send for complete list. Reply Box 1545, Modern Plastics.

FOR SALE: Hydraulic Presses; 32" x 50", 24" ram, 700 ton, 21" x 24", 20" ram, 500 ton, 36" x 52", 14" ram, 385 ton, 36" x 36", 16" ram, 200 ton, 26" x 30", 15" ram, 177 ton, 13" x 19", 12" ram, 100 ton, 19" x 24", 10" ram, 78 ton, 23" x 17", 8" ram, 75 ton, 15" x 15", 8" ram, 75 ton, 12" x 12", 7½" ram, 50 ton, 12" x 13", 6½" ram, 42 ton, 8" x 9½", 4½" ram, 20 ton, 16" x 16", 3½" ram, 12 ton; Pumps: New Dual Rotary Pumping Units; HPM Triplex 1½ GPM 2500#; Robertson Duplex 1½ GPM 4000#; Worthington Triplex 12 GPM 2500#; Gould Triplex 12 GPM 1250# Worthington 2½ GPM 4000#; 4 plunger 6 GPM 2000#; Watson Stillman Duplex 1 GPM 2500#; Laboratory Mill 7" x 14"; Extruder, No. 3 Royle Perfected, m. d.; National Rubber Mchy. 2½" Plastic Unit, m. d.; W&P unjacketed sigma blade mixer, 100 gal. cap., Laboratory Presses, Hydro-Pneumatic and weighted type accumulators, q. o. door vulcanizers, etc. HIGHEST PRICES PAID FOR YOUR USED EQUIPMENT. Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13.

WANTED—ASSISTANT Superintendent for large Midwestern Injection Molding Plant. Five years experience required. Reply Box C457, Modern Plastics.

WANTED—MOLDING Department Foreman (night shift) for large Midwestern Injection Molding Plant. Five years experience required. Reply Box C456, Modern Plastics.

WANTED

Industrial Enterprise

CASH PAID

For Capital Stock or Assets

by large financially powerful diversified organization wishing to add another enterprise to present holdings.

Existing Personnel Normally Retained

Strictly Confidential

Box 1230, 1474 B'way, New York, N. Y.

WANTED MOLDS FOR EXPORT new or used, ready for use for any kind of items adaptable to a plastic injection machine of following specifications: injection capacity: up to 3 ounce; maximum combined mold thickness: 9 inches; minimum combined mold thickness: 4¼ inches; maximum mold area: 10½" x 10½"; mold opening stroke: 9". Submit offers to Box C483, Modern Plastics.

WANTED: Technically trained man for work on laboratory staff of a well-known paper company in attractive small city in midwest. Must be capable of carrying out a research and development program in connection with resinous formulations. Previous experience in similar fields necessary. Reply Box C475, Modern Plastics.

WANTED: SPOT Lots of Plastic Materials including molding powder, films, sheets, rods, tubes, etc., both thermosetting and thermoplastic. Dussi-Wallace and Company, 60 East 42nd Street, New York City.

SALES ENGINEER WANTED—Experienced man wanted by well established New York City extrusion house. Capable salesman will be backed by first class production and well seasoned experimental department. Reply stating qualifications. Box C509, Modern Plastics.

ENEMY SECRETS TRANSLATED—Free list of translated KUKO (I.G. Farben) Reports on Plastics and Plasticizers, containing many manufacturing secrets, from Accurate Translation Service, Inc., 711 Woodward Building, Washington 5, D. C.

WANTED — REPRESENTATIVE by well-established compression molder. Must be thoroughly familiar with all phases of molding and acquainted with trade in Metropolitan area and New York state. Excellent opportunity. Confidential. Box C485, Modern Plastics.

LUCITE RODS diameter ¾" to 2¼" quantity will sell at right price. Reply: 4 Star Frames Mfg. Corp., 1620 Webster Ave., Bronx 57, N. Y.

MODERN PLASTICS ADVERTISERS

DECEMBER 1947

(*Please turn to page 246*)

Everyone's Talking
about the BALDWIN-SOUTHWARK
HIGH PRODUCTION
PLATEN PRESS

I like its huskiness; ample strength in that top means low deflection.

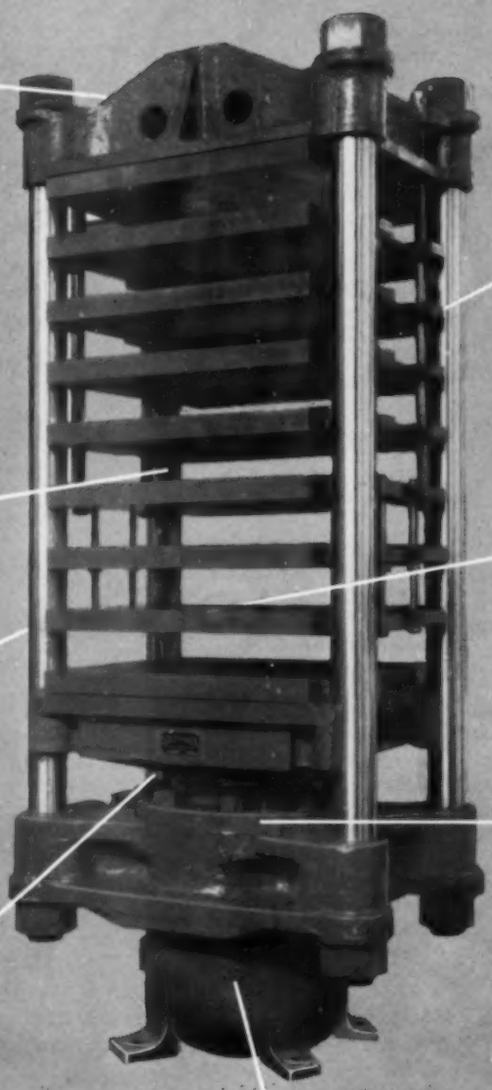
It's fine for fast curing cycles; those drilled circulating ducts give even heating and quick cooling.

It's good at maintaining tolerances; those low stressed columns mean negligible deformation under heavy loads.

The adaptability appeals to me; it's packed for either oil or water operation.

That press gives high production, low rejects . . . what we need today!

That modern cylinder design appeals to me. It's got a hemispherical bottom, and integral supporting feet.



There's good engineering! Platens are properly guided for true travel.

Meets all our needs . . . we have our choice of platen finishes: smooth tooled, oil and emery, or mirror polish.

I can keep that press in operation easier; it's outside packed for easy maintenance.

We don't have to worry about having a piece of "orphan" equipment. Baldwin retains drawings and patterns.

Write for literature

BLW THE BALDWIN GROUP

BALDWIN
HYDRAULIC
STEAM PLATEN PRESSES

The Baldwin Locomotive Works, Philadelphia 42, Pa., U.S.A.
Offices: Philadelphia, New York, Boston, Norfolk, Birmingham, Houston, St. Louis, Chicago, Cleveland, Detroit, San Francisco, Washington, Pittsburgh, Seattle.

(*Please turn to page 248*)

A telephone listens to a loud speaker in the new "free field" acoustic test room at Bell Telephone Laboratories. The sound-transparent "floor" is built of steel cables.

Test-tube for Sound

This giant "test-tube" is actually an echoless sound room at Bell Telephone Laboratories. Here engineers seek new facts about sound which will help them make telephone service still better and more dependable.

Bell scientists know a great deal about what happens to sound in electrical systems. This new room will give them a powerful tool to find out more about what happens to sound in the air.

In an ordinary living room, most of the sound addressed to you comes by way of reflections. At 10 feet less than 10% reaches you directly.

Sound that *bounces* at you from walls, ceilings, furniture, and your body is all right for hearing—but it poses questions for scientists who would study it uncontaminated by reflections.

The Bell Laboratories "test-tube" gives telephone people the chance to produce pure sound and analyze it reliably with respect to intensity, pitch, and direction. The entire room is lined with glass wool, contained in wire-mesh cases, wedge-shaped to give maximum absorbing area. Sound bounces along the sloping surfaces, sifts into the soft glass wool, and is gradually stifled.

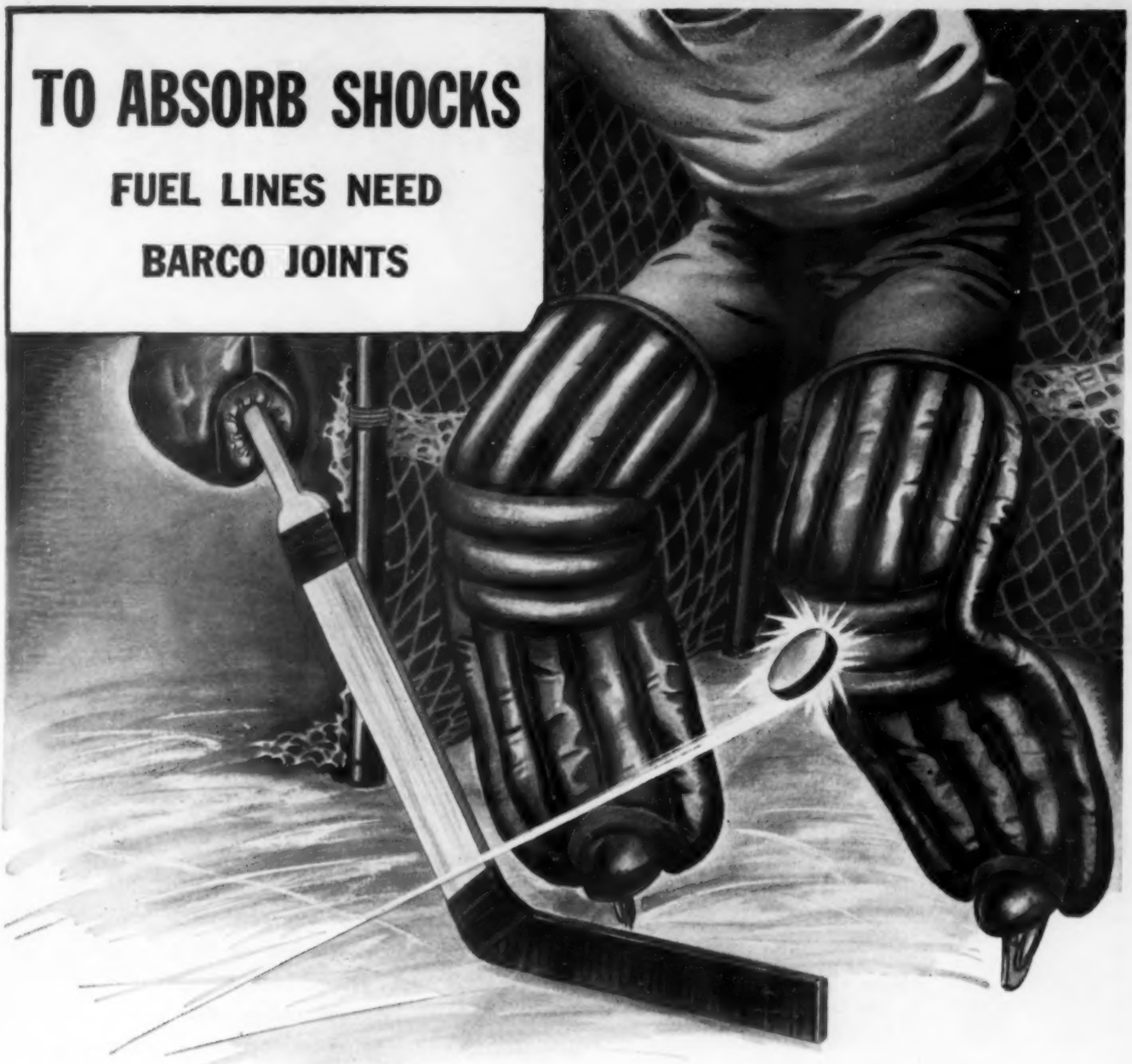
This is one more example of Bell Laboratories' constant work to learn more about everything which can extend and improve telephone service.

BELL TELEPHONE LABORATORIES

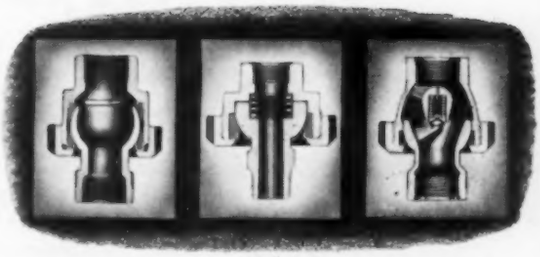
Exploring and inventing, devising and perfecting for continued improvements and economies in telephone service.

TO ABSORB SHOCKS

FUEL LINES NEED BARCO JOINTS



Fuel lines don't last long unless, like this hockey goalkeeper, they are protected from impact and shocks. Barco Flexible Joints, by responsive movement through every angle, absorb shocks and stresses in fuel lines, compensate for expansion and contraction. For over 30 years, these valuable time and cost savers have been guarding fluid-conveying systems from the deadly effects of vibration, preventing leakage and fractures. Whatever your special installation may be, you'll find the right joint for it in the Barco line. Write for complete facts. Barco Manufacturing Company, Not Inc., 1809 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Can.



BARCO FLEXIBLE JOINTS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN EVERY DIRECTION"

Here's a New Wonder molded from a Wonder-Plastic...

Container by Plax Corporation, Hartford, Conn

TRADE-MARKS

BAKELITE

POLYETHYLENE

IT'S A BOTTLE . . . and it squeezes!

It's a new use of a wonder-plastic that may cause some quick changes in the plans of scores of manufacturers—anybody who puts up anything in bottles, jars, cups, crocks or mugs.

Although this deodorant bottle is only one of dozens of new articles molded from BAKELITE Polyethylene Plastic, it shows—perhaps better than anything could—one great advantage of this material: its virtual unbreakability.

Important property! But there is more to tell. The material is *inherently* pliant and flexible. It is *inert, tasteless, odorless, non-toxic*—therefore suitable for foods and cosmetics. It is highly resistant to chemicals—even acid carboy cap-liners are made of it. It can have threads molded in, as in the "Thermos" bottle cups. Its dielectric strength approaches that of *mica*—ideal in many electrical applications. Its light weight reduces shipping costs. And it can be produced in delicate pastel shades or beautiful solid colors—and molded with ease by standard methods.

Molders and manufacturers—BAKELITE Polyethylene is worth your *immediate* study. In addition to its other virtues it is an *economical* plastic material, one that can actually reduce your costs. Investigate! Write Department CX-10 for full technical data and the help of BAKELITE Corporation technicians in developing *your* new applications.

BAKELITE CORPORATION

Unit of Union Carbide and Carbon Corporation

UCC

30 East 42nd Street, New York 17, N. Y.

• ENGINEERED IN PLASTICS BY GENERAL ELECTRIC

Plastics strike the right note

• Now it's plastics for pianos! Plastics parts for piano actions, molded by General Electric for Pratt, Read & Co., Inc., are reported in a magazine article to represent "one of the greatest innovations in the piano industry in a century." For this application, G.E. selected a durable plastic material (ethyl-cellulose) that is unaffected by moisture or weather. The uniformity and stability of the plastics parts help assure true tone and keys that never stick. Moreover, the use of plastics speeded and simplified Pratt, Read's assembly process.

Whether *your* plastics job is "something special"—or an ordinary one—you can benefit by General Electric's *complete* plastics service. G.E. can carry your plans from drawing board to delivery platform—design, engineer and mold plastics parts to meet your own individual requirements.

If You Have a Plastics Problem—General Electric has the answer. General Electric design and production "know-how" can reduce your costs, improve your product. For more details, call your nearest G-E Sales Office. Or write for information and your free copy of the interesting, full-color booklet, "Problems and Solutions in Plastics," to Plastics Division, Chemical Department, General Electric Company, 1 Plastics Avenue, Pittsfield, Massachusetts.

G-E COMPLETE SERVICE—AT NO. 1 PLASTICS AVENUE

Backed by 53 years of experience. We've been designing and manufacturing plastics products since 1894. General Electric research facilities have expanded continually, working to develop new materials, new processes, new applications for plastics parts.

No. 1 Plastics Avenue—complete plastics service—engineering, design, mold-making. G-E industrial designers work with our engineers to create plastics parts, sound and good looking. Skilled mold-makers in G-E toolrooms average over 13 years experience.

All types of plastics. Compression, injection, transfer and cold mold facilities . . . high and low pressure laminating . . . fabricating. G-E Quality Control—a byword in industry, means as many as 160 inspections and analyses for a single plastics part.

EVERYTHING IN *Plastics*

GENERAL ELECTRIC

CD17-A50

General Electric plastics factories are located in Scranton, Pa., Meriden, Conn., Coshocton, Ohio, Fort Wayne, Ind., Taunton and Pittsfield, Mass.